DOCUMENT RESUME

ED 315 286 SE 051 167

AUTHOR Heller, Barbara R.
TITLE A Distance Learning Approach to Quality Mathematics Instruction in Nonpublic Elementary Schools.
INSTITUTION City Univ. of New York, N.Y. Center for Advanced Study in Education.
SPONS AGENCY New York State Education Dept., Albany. Bureau of Grants Administration.
REPORT NO CASE-05-89
PUB DATE Jul 89
NOTE 168p.; Drawings may not reproduce well. Occasional pages with toner streaks; 1 page (p. 53) with light type.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC07 Plus Postage.
DESCRIPTORS *Distance Education; Elementary Education; *Elementary School Mathematics; *Inservice Teacher Education; Mathematical Concepts; Mathematics Anxiety; Mathematics Curriculum; Mathematics Education; *Mathematics Instruction; Mathematics Materials; *Mathematics Teachers; *Private Schools; Staff Development; *Videotape Cassettes
IDENTIFIERS New York (New York)

ABSTRACT

This is the narrative report of a project (begun in 1985) undertaken to promote quality mathematics instruction in the nonpublic, religion-oriented elementary schools in New York City. The major goals of the project for the 1988-89 year were to involve nonpublic schools (NPS) teacher representatives in the planning and creation of staff development videocassettes in mathematics, provide teachers with live workshops, and demonstrate that the training tapes have potential for surmounting the barriers to effective inservice teacher training. These project activities are described in three sections: planning and development activities, conduct of workshop series, and production of prototype tapes. The six workshops and participants' assessments of them are described. The workshop titles are: (1) "Calculators in the Classroom"; (2) "Integrating Math and Science"; (3) "Math Anxiety"; (4) "Decimals"; (5) "Mastering Fractions"; and (6) "Geometry." A summary evaluation report and workshop materials are appended. (CW)

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A DISTANCE LEARNING APPROACH TO QUALITY MATHEMATICS INSTRUCTION IN NONPUBLIC ELEMENTARY SCHOOLS

BARBARA R. HELLER

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A DISTANCE LEARNING APPROACH TO QUALITY MATHEMATICS INSTRUCTION IN NONPUBLIC ELEMENTARY SCHOOLS

BARBARA R. HELLER

CASE 05-89
JULY 1989

The project reported on herein was performed under a New York State Education Department Grant, EESA Title II, Project No. 132-89-0034.

Center for Advanced Study in Education
The Graduate School and University Center
of the City University of New York
33 West 42 Street, New York, N.Y. 10036

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The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Bureau of Grants Administration
Albany, New York 12230
(518) 474-5705

EDUCATION FOR ECONOMIC SECURITY ACT, TITLE II
HIGHER EDUCATION GRANTS PROGRAM

FINAL NARRATIVE REPORT
Fiscal Year 1988-89

Please return two copies of the completed report to: Bureau of Grants Administration, New York State Education Department, Room 5B68, Cultural Education Center, Albany, New York 12230 no later than September 30, 1989.

GENERAL INFORMATION

Name of Institution: Center for Advanced Study in Education
Graduate School and University Center
City University of New York

Mailing Address: 25 West 43rd Street, Room 300
New York, New York 10036

Project Title: A Distance Learning Approach to Quality Mathematics Instruction in Nonpublic Elementary Schools

Amount of Grant Award: $ 46,000. Project #: 132-89-00

Project Director: Barbara R. Heller

Title: Project Director

Phone: (212) 642-2910
Area Code (Extension)

Person completing report, if other than project director:

Phone: ( )
Area Code (Extension)

FISCAL INFORMATION

Total Amount of Grant Award: $ 46,000

Total Payments received to Date: $ 41,400

List Expenditures to Date:

Item	Amount
Professional/Nonprofessional Salaries	$ 19,984
Employee Benefits	$ 4,882
Purchased Services	$ 7,677
Supplies and Materials	$ 4,590
Travel Expenses	$ 190
Other Expenses	$ ------

GRAND TOTAL: $ 37,233

List all matching funds and/or in-kind contributions made to this project to date by:

Source	Amount
Not Applicable	$
	$
	$
	$

PROJECT STAFF AND COOPERATING AGENCIES

Professional Staff - List all professional personnel supported by project funds and provide the requested data:

Name	Agency/Department	Responsibility	% Time
Barbara R. Heller	CASE	Project Director	15.3% + summer salary

Nonprofessional Staff - List all nonprofessional staff supported by project funds and provide the requested data:

Name	Responsibility	% Time

Graduate/Undergraduate Assistants - Indicate the number of college students supported by project funds:

Number	Responsibility	
Alfredo Dubraycic	Associate	45% FTE
Jamila Pittalwala	Associate	
Joyce Blanchette	Associate	

Cooperating Agencies - List each of the school districts, nonpublic schools, teacher centers, postsecondary institutions, professional organizations, and other agencies involved in the planning, implementation, referral or evaluation of the project and indicate the nature of their participation:

Agency	Plan	Implement	Referral	Evaluate
Agudath Israel of America	[X]	[X]	[X]	[X]
Board of Jewish Education/Greater NY	[X]	[X]	[X]	[X]
Catholic Archdiocese of New York	[X]	[X]	[X]	[X]
Catholic Archdiocese of Brooklyn	[X]	[X]	[X]	[X]
Greek Orthodox Archdiocese	[X]	[X]	[X]	[X]
National Assoc. of Episcopal Schools	[X]	[X]	[X]	[X]

PARTICIPATING TEACHERS

Please provide the following data for the public and nonpublic school teachers being served by the project:

Public School Teachers

GRADE LEVEL			DISCIPLINE			SEX		RACE/ETHNICITY*					
E	JR/MID	HS	MA	SC	FL	F	M	B	H	W	A	I	O
					NOT APPLICABLE								

*(B) Black, (H) Hispanic, (W) White, (A) Asian/Pacific Islander, (I) Native American Indian/Alaskan Native and (O) Other - please specify.

Nonpublic School Teachers

GRADE LEVEL (Grades 3-8)			DISCIPLINE			SEX		RACE/ETHNICITY					
E	JR/MID	HS	MA	SC	FL	F	M	B	H	W	A	I	O
30	---	---	@25	@5	--	@21	@4	---	---	Not Available		---	---

* Use the Race/Ethnicity key shown above.

Did you offer Inservice X Preservice -- Recertification --

Did you give academic credit for courses taken? Yes ___ No X
If yes how many? Graduate ___ Undergraduate ___

What format do you use?
Institutes - Summer -- Academic Year --
Workshops X
Seminars --
Other - please specify _____

Indicate the average length of these programs in weeks. 6 weeks +

STUDENT ROSTER

Please provide the following information for ALL students enrolled in the project:

Last Name, First Initial (in alphabetical order)	S.S. No.	**Grade Level E/JR/HS	Sector Public/ Non Public	*Race/ Ethnicity	No. of Courses Failed to Date M/Sc/FL
1.					
2.		Not	Applicable		
3.					
Total					

* Use the same key as shown in the teacher data.
**(E) Elementary (JR) Junior High (HS) High School

A DISTANCE LEARNING APPROACH TO QUALITY MATHEMATICS INSTRUCTION IN NONPUBLIC ELEMENTARY SCHOOLS

For the 1988-89 school year, The Center for Advanced Study in Education--CASE--of The Graduate School and University Center of The City University of New York (CUNY) continued its efforts to promote quality mathematics instruction in the nonpublic, religiously-oriented elementary schools in New York City. Through the conduct of a 6-session workshop program, which was videotaped in its entirety and which formed the basis for training tapes on mathematical subjects and processes critical in grades 4,5, and 6, CASE not only worked directly with participating teachers, but, importantly, developed a strategy that has potential for other groups of teachers throughout the City and State.

BACKGROUND

CASE initiated its first project directed to teachers in the nonpublic, religiously-oriented schools in New York City in 1985-86 with a grant from the New York State Education Department under Title II of the EESA. That project, which involved Catholic, Jewish, and Greek Orthodox schools, was an outgrowth of a recertification program in mathematics that CASE had developed in 1983 under contract to the New York City Board of Education.

The MATHEMATICS CENTER, as the recertification program was called, was designed to increase the number of mathematics teachers and improve the quality of instruction in mathematics by retraining teachers who held current licenses in other subject areas. The

MATHEMATICS CENTER[1] drew teachers from the nonpublic schools as well as from the public schools, underscoring their similar needs for up-to-date training in mathematics ideas and techniques and leading to the conduct of companion programs, including the forerunner of this current year's effort.

In the first-year program exclusively for the nonpublic schools, CASE conducted site visits at approximately 40 nonpublic elementary schools, offering principals and teachers technical assistance, including classroom demonstrations. The program also provided seminars and conferences for more than 150 teachers and administrators; and formal training consisting of two three-credit undergraduate and graduate-level mathematics courses for approximately 50 teachers.[2]

The second year of this exemplary project continued only one of these thrusts--on-site visits to the schools--as a result of funding restrictions. More than 135 teachers of grades 3-6 from 20 nonpublic schools (NPS) participated during 1986-87. Two visits were made to each school, one in the Fall and one in the Spring, at which time the project's technical advisor either worked

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1 B.R. Heller, CUNY/Board of Education MATHEMATICS CENTER: Spring/Summer 1983. Center for Advanced Study in Education, The CUNY Graduate School and University Center, November 1983 (mimeo).

2 B.R. Heller, A Model Demonstration to Improve Mathematics Instruction in Grades 5-9 in Nonpublic Religiously-Oriented Schools in New York City. CASE #05-86, The Graduate School and University Center, The City University of New York, November 1986.

individually with two teachers, or held workshops for larger groups. In several instances, both types of assistance were provided, in addition to in-classroom demonstrations.[1]

Teacher participants, principals, and the project's external evaluator judged the program as highly effective, and supported a third-year proposal. As one NPS administrator commented, "We were all inspired and benefited greatly...and request additional, more frequent opportunities of this kind in the future."[2]

The 1987-88 academic year, year 3, saw a somewhat increased level of support which permitted CASE Project Staff to hold workshops for grades 4,5, and 6 teachers from 26 NPS (one workshop for each grade, for a total of three workshops); followed by grade-specific study-groups (one set of three study-groups for each grade, organized by geographic area, for a total of nine small groups.)[3] The workshops introduced participants to new concepts and methodologies in mathematics (such as, for example, the use of manipulatives as they pertain to transformational geometry, measure-

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1 B.R. Heller, A Continuation of a Model Demonstration for Quality Mathematics Instruction in Nonpublic Religiously-Oriented Schools in New York City. CASE #04-87, The Graduate School and University Center, The City University of New York, September 1987.

2 ibid.

3 B.R. Heller, Focus on the Middle Elementary Grades: A Continuation Project to Promote Quality Mathematics Instruction in the the Nonpublic Religiously-Oriented Schools in New York City. CASE #07-88, The Graduate School and University Center, The City University of New York, September 1988.

ment, similarity, and constructions (grade 4); numbering systems and coordinate geometry (grades 5 & 6); and probability and statistics (grades 5 & 6).). The study-groups provided teachers with intensive opportunities to explore specific content and instructional techniques in an in-depth manner under the direction of an expert consultant. The consultant also assisted teachers in adapting the material to their own classrooms and provided them with feedback about their use of the materials.

While most teachers were enthusiastic about learning how to use manipulative materials, a few others were less motivated to put in the effort required to achieve competence and ease. Relatively low attendance at the study-group sessions probably reflected these attitudes as well as other real problems unique to nonpublic schools.

For example, when attempting to work with the various religious school systems, the scheduling of activities becomes a major concern. In addition to certain times of the year being very busy for all schools, public and nonpublic, late spring is also a time filled with many religious observances: the major holidays--Easter, Greek Orthodox Easter, and Passover--which frequently do not overlap, effectively take 2 1/2 weeks out of the calendar; other holidays, such as Purim and certain Saint Days, also affect scheduling. These school closings, coupled with the fact that neither Friday afternoons (before the Jewish Sabbath) or Wednesday afternoons (when public school children go to the NPS for religious instruction), create added difficulties in planning events so as to

encompass more than one religious group. While not impossible, most spring dates are certain to occur close to a day on which some schools are on holiday, thereby making it problematic whether the principal will allow or encourage teachers to be out of school for a workshop. The problem becomes even more exaggerated when two other factors are considered.

First, in terms of motivation, the fact is that for several of the NPS systems, promotion, tenure, and/or salary increases are not necessarily tied to in-service credits or advanced degrees. Teachers, therefore, have to be internally motivated to take part in these types of activities. While in some cases they may have the support of the principal--some principals clearly recognize the worth of these activities--it is important to remember that the use of substitute teachers (the second factor) is not as easily arranged in the nonpublic as in the public schools, nor as cost-free to the school.

Other than the problems involved in scheduling, and the related issues, is the fact that the NPS with whom we have been working are spread out geographically across the entire City, often more than an hour's travel time away from the site of the planned event. Since many of the elementary schools we are serving are also very small, with only one fourth- or one fifth-grade teacher, for example, this often means that a particular teacher is the only one from her/his school eligible to take part in the project. She/he, therefore, has to travel alone to a distant site, often not

knowing any other participant and, furthermore, make the trip back home alone at the end of the day on public transportation. For many NPS elementary teachers who walk to their neighborhood school, or take a short car ride, travel is the biggest negative in their decision to participate in the project.

These difficulties notwithstanding, the 1987-88 project for teachers from the NPS was successful in meeting its goals, responding to the needs of the target teachers, and otherwise impacting positively on the participating schools. However, despite the plan to hold the study-groups as close as possible to the more outlying schools, the project was somewhat less effective in overcoming all of the administrative challenges posed by working with the religiously-oriented school systems.

Another grant from the New York State Education Department for 1988-89 enabled Project Staff to begin to develop a strategy--namely videotape instruction--that has the potential to bypass all of these organizational hurdles while continuing to meet the project's overall goal with respect to the NPS: namely, improving grades 4,5, and 6 teachers' knowledge of mathematics and their teaching skills.

GOALS AND OBJECTIVES

As noted, NPS school teachers need and welcome special attention to make up for their generally poor background in mathematics, a characteristic they share with elementary school teachers throughout the nation. They welcome new positive experiences to

combat common misconceptions and fears about mathematics and how it is "done," and detailed training to help them implement recent and farreaching changes in the mathematics curriculum. However, as explained above, training opportunities are frequently effectively unavailable to NPS teachers. Compounding the absence of in-service courses is the fact that several of the different school systems operate independently of one another--as, for example, the Roman Catholic Archdiocese of New York and the Brooklyn Diocese, and the Reformed, Conservative, and Orthodox Jewish schools--as well as problems stemming from the small size of many elementary schools; the geographic spread of the schools in communities throughout the City and State; and the frequent lack of "substitute teachers" or other arrangements that would facilitate teachers' participation in staff development programs during school hours. Moreover, other factors impede teachers attending afterschool programs. For some denominations, the school day extends until 6:00 p.m. and, in other instances, many NPS teachers work at a second job. These problems, while characteristic of the larger cities, are even more acute in the small cities, suburbs, and outlying areas of the State. Distance learning strategies, including the use of correspondence courses, computer networks, videocassettes, and multimedia packages, have been used to respond to these specific types of barriers.

There were three major goals and several subsidiary objectives for the 1988-89 year. Specifically, the project sought to:

1. Involve NPS teacher representatives in the planning and creation of staff development videocassettes in mathematics that can be used both by individual teachers and by groups in a self-study learning mode or with trained leaders. This involved:

   - expanding the Advisory Committee to include representatives of the NPS teacher population and also CUNY mathematics faculty familiar with math education at the elementary level;
   - updating the needs assessment conducted in 1986-87 and 1987-88 as one of the bases for determining workshop content; and
   - developing topics, formats, and broad scripts for the six workshops--videotaped instructional episodes.

2. Provide teachers in live workshops with structured opportunities to develop attitudes for and basic background information needed to implement the new elementary-level curriculum. In accomplishing this goal, Project Staff:

   - enlisted the involvement of the NPS which have been the primary recipients of training in prior years; and added additional schools from the Catholic, Episcopal, Jewish, and Greek Orthodox systems to ensure a full complement of participants;
   - recruited teachers in grades 2-3 through grades 5-6 to attend the workshops and be videotaped. To encourage adequate teacher representation from the target schools, copies of the videotapes were to be provided as an incentive;
   - worked intensively with two elementary school teachers who served as workshop leaders, "live" and on tape; and
   - conducted a total of six workshops during the January-April 1989 period at which attending teachers took part in structured learning experiences; and which were also videotaped to produce six training tape episodes.

3. Demonstrate that training tapes in videocassette format

have potential for surmounting the historic barriers to effective inservice teacher training associated with small numbers, a diverse geography, scheduling restrictions, and budgetary constraints associated with NPS. To this end, Project Staff:

- reviewed all tapes, alone and with consultants, to make a preliminary set of edited tapes;
- refined the first edit of the six workshop tapes, adding transitions and additional footage; and
- produced the prototype set of tapes for dissemination to the target schools. All tapes were assessed by members of the Advisory Committee and target school teacher representatives.

It should be noted that there is a dual pursuit in this year's project: to provide participants with real, hands-on, useful, and practical experiences in the workshops; and to produce a set of "finished" tapes based on "live" (in contrast to "produced") material. The project activities, which will be described in detail in the following section of the report, were designed not only to meet these objectives, but also to: assist teachers in implementing the Regents Action Plan to Improve Elementary and Secondary Education Results; encourage teachers from schools with different religious affiliations to meet together and form stronger working relationships; provide teachers with sample materials they could use in their classrooms and motivate them to explore other, up-to-date resources; and, through modeling, stimulate teachers to try new techniques and approaches to mathematics.

The specific choice of activities, from the large array of

existing staff development strategies, reflects our past successes in working with this target population of teachers, as well as their strengths and weaknesses and our philosophy of what mathematics is and the ways that it is most effectively learned.

PROJECT ACTIVITIES

Planning and Development activities, the Conduct of the Workshop Series, and the Production of Prototype Tapes constituted the project's three major phases and cover, respectively, staffing the project, convening the Advisory Committee, selecting participants (schools and teachers), updating the needs assessment, selecting and training workshop leaders, choosing workshop topics, developing scripts and assembling materials, and working with the production team on format, sequencing, and scheduling; arranging a workshop schedule and holding six meetings over a 3-month period, and monitoring and evaluating the sessions; and assessing, reviewing, and editing the tapes in two stages, and producing and testing the final version.

Planning and Development

A large part of the total year's effort went to preparing for the conduct of the workshops, and their videotaping, and included the activities noted above which will be described in the approximate order in which they occurred.

Project Staffing. The Project Staff included the Director (the author of this report); an Associate, a doctoral student at The Graduate School and University Center; and five consultants. Two

of the consultants were elementary school teachers--one taught the 5th grade and ran the Resource Center at SAR Academy, a Jewish Day School in the Bronx; and the other was the mathematics and science coordinator at St. Anthony School, part of the New York Roman Catholic Archdiocese in Manhattan. The teacher from St. Anthony was known to the Project Director as a result of his participation in the 1985-86 summer program. He was also well-known to the Advisory Committee for the work he had done for the New York Archdiocese. The teacher from the SAR Academy was also highly recommended by the Advisory Committee which noted her enthusiasm and love of mathematics and her work in an exemplary mathematics project for gifted first and second graders.

Both technical consultants had also had prior experience with this project, having taken part in the project in earlier years. Both are University mathematics professors, one of whom directs the Mathematics Learning Center at Hunter College. The other is an expert in elementary mathematics education at Queens College. These two consultants have had extensive experience in making presentations to teachers and potential teachers in formal settings and at in-service workshops. They have also individually authored numerous books and articles for professional journals.

The fifth consultant was the Evaluator (whose report is appended, see Appendix A). She, too, was familiar with the project and with the NPS teacher population as a result of earlier experiences with the project.

Consultants and staff met frequently during the year. The initial meetings, which included other Advisory Committee representatives, were for the purpose of clarifying--operationalizing--the goals and objectives and delineating project responsibilities. Subsequent meetings in the late Fall-early Winter were to plan each workshop, complete with script and materials. Prior to each workshop, we also held a final, "dress rehearsal" (see below). And we met to review the feedback from participants and to view the raw footage of a just-completed workshop. Frequent telephone conversations supplemented the in-person meetings and allowed the Staff to remain in good communication. Although many of the meetings took place at the Graduate Center and the technical consultants' colleges, the Project Director also visited the group leaders, observing them in the classroom and with groups of students.

Advisory Committee. The Advisory Committee was made up of representatives of Agudath Israel of America, Inc.; the Board of Jewish Education of Greater New York; Catholic Archdiocese of New York; Catholic Diocese of Brooklyn; Greek Orthodox Archdiocese; and the National Organization of Episcopal Schools. It also included the Project Director and Associate, the five consultants, and the Director of CASE and the University Dean for Community Development, both of whom served in an ex-officio capacity.

The Advisory Committee met both formally, at which meetings most members or representatives were present, and also had frequent informal discussions with Project Staff. The Agenda for the

September 8, 1988 meeting, the first meeting of the current year, brought the Advisors together to talk about the selection of schools and participating teachers, the workshop topics and scheduling issues, and the procedures for conducting and producing the videotapes.[1] Regular discussions with Advisors, individually and in small groups, further defined the potential problem areas and led to alternative courses of action. They also served to provide us with on-going feedback from the schools' administrations. (It should be noted that all Advisors were actively interested in the project--and have been since its inception--assisting Staff in numerous ways, always available to respond to specific requests, and actively promoting the project both within and without their school systems.)

The Advisory Committee's first order of business, as noted, was to settle on procedures for inviting schools to take part in the project and for ensuring their regular participation, and to orient the old and replacement schools and prepare them for their responsibilities vis-a-vis the project. A description of the schools from which we recruited teachers to take part in this year's project follows.

Project Participants. As a result of the introductory meeting, the Advisors sent us an updated list of 30 schools that included most of the 26 schools that participated in last year's

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[1] Appendix B contains the agenda for the first meeting of the Advisory Committee.

project plus an additional eight schools that were new to the project in 1988-89.

There were three schools nominated by Agudath Israel of America; two that had participated in prior years plus one new one); nine schools (six plus three) listed by the Archdiocese of New York; seven schools, including two new ones, on the Board of Jewish Education's original list; the Catholic Diocese of Brooklyn submitted names of seven schools (six plus one); one Episcopal school was included; and the Greek Orthodox Archdiocese sent in a list of four schools (three plus one). All of these schools had been contacted by the respective Advisor representative who explained what the project emphasized this year and what it entailed; and all, apparently, had expressed interest in it. Some provided the names of teachers who could be expected to attend.

With this in mind, the Project Director sent a followup letter to these 30 principals (see Appendix B), providing more specificity about the project, including the topics and dates of the workshops, the fact that they would be taped, and so on. The letter also spelled out the schools' responsibility: "To receive [a set of the six] videotapes and training [of participating teachers in how to use the tapes with colleagues], a school must be represented at a minimum of three of the six workshops... The same teacher(s) does not have to take part in all three or more sessions..."

Allowing the principal ample time to share the letter with teachers and to assess their interest, the Project Director phoned the schools during November and December. Although feedback

indicated enthusiasm in some instances, hesitancy on the part of some principals--and disinterest from others--suggested early on that we expand the list of invited schools. On the advice of the Advisors, we added other schools that had participated in earlier years as well as additional new referrals. In many cases, after repeated phone calls and call backs, staff spoke with the principals (or their representatives, usually a Coordinator or Director--in one or two schools, the Secretary) of 40 schools.

Basically, two types of conversations were held. The most productive discussion occurred when the principal had the letter in hand, recalled its content, and had elicited interest from one or more of her/his teachers. This characterized about half of the schools. The other administrators "never received the letter" and/or did not remember what the project was, or had "no teachers who were interested." The reasons that were advanced for the teachers' alleged disinterest included the fact that some were already "taking part in courses for college credit," others felt there was "nothing that would benefit them," while a few teachers, including one or two who had come last year thought that "it might just be a repeat" so that it was hard to "rekindle their desire." Other principals were concerned about the location, the traveling, and the fact that it "was being done during school days and we have only one math teacher"--expressions of problems relating to the distance between sites, the parochialism (no pun intended) of the target teacher population, and the small size of some schools.

A total of 16 different schools (40% of those contacted) signed up for one or more workshop sessions. Catholic schools (from both the New York Archdiocese and the Brooklyn Diocese), Hebrew Day Schools (affiliated with both Agudath Israel and the Jewish Board of Education), Greek Orthodox schools, and an Episcopal school were represented in roughly the same proportion in which invitations were extended. Names of 36 teachers were submitted, an average of approximately 1.5 people per school. As we will see below, somewhat fewer teachers actually came to the meetings, although it should be pointed out that, according to their reports and the feedback from principals, participants shared their experiences with many colleagues.

Workshop Leaders. As originally intended, one or both of the technical consultants (i.e., the college-level mathematics professors) were to serve as workshop leaders. After extended discussion, which focused mainly on the unique problems presented by the videotaping, the Advisors agreed that using representatives of the target population as leaders had more advantages.

The reasons had to do with establishing a high level of credibility both with the actual participants and with the ultimate audience--the viewer of the videotape. This audience was projected to be teachers of the elementary grades in nonpublic (and, perhaps, public as well) schools throughout New York City (and, possibly, beyond that geographic boundary.) The decision to use elementary school teachers as workshop leaders was also based on the need for an unusually high level of audience interaction. It was felt that

elementary teachers, working with participants who were elementary school teachers, might best facilitate this.

To this end, the Advisory Committee recommended two teachers. One, as noted, taught fifth grade at one of the Jewish Day Schools. She also had some experience conducting workshops for teachers as well as some familiarity with special programs, being involved with a project for gifted first- and second-graders. The other leader was a teacher at a Catholic elementary school where he served as the mathematics-science coordinator. He has also conducted numerous workshops for the Archdiocese and is the consultant for the Archdiocesan television programs dealing with mathematics and science.

Both teachers were interviewed by the Project Director and technical consultants. The interviews dealt with the commitment of time, the workshop topics (see below), and the degree of discomfort evoked by videotaping. The Project Director visited SAR Academy to see the teacher in the classroom (and to meet the principal) and to observe the school's involvement with mathematics. As was mentioned above, we were already very familiar with the teacher from St. Anthony through his participation in other of our programs. To round out our assessment, we spoke with their principals who assured us that they would be available for the time the project required. The principals also confirmed our impressions of their enthusiasm for mathematics and their potential as workshop leaders.

Workshop Topics (needs assessment). Formal needs assessments had been conducted in 1987-88 and in 1986-87 with a group of teachers from the nonpublic elementary schools in New York City. In addition, Staff and consultants had informally monitored teachers' strengths and weaknesses in mathematics as these were manifested in workshops and small-group interactions, and in the classrooms where we provided technical assistance. On the basis of this input, we generated a list of possible workshop topics including:

- math anxiety
- learning styles (and metacognition)
- calculators
- testing and homework
- teaching with manipulatives
- standard mathematical content, including fractions, decimals, and percentages
- newer mathematics subject areas, including transformational geometry, spatial visualization, problem-solving, and probability and statistics
- involving parents in mathematics learning, and
- integrating mathematics into the curriculum.

This list was reviewed by the Advisory Committee, including the Project Director, technical consultants, and workshop leaders; and by groups of NPS teachers convened for other purposes (e.g., participants in a demonstration of science concepts held by the New York Catholic Archdiocese.)

On the basis of the accumulated feedback, and in consideration of the expertise of the workshop leaders, the following six topics were selected as the focus for this year's videotaped sessions (listed in the order in which they were scheduled):

1. Calculators in the Classroom
2. Integrating Mathematics and Science
3. Math Anxiety
4. Place Value (Decimals)
5. Fractions
6. Geometry

One leader would conduct workshops #1, 5, and 6, as well as co-lead (with the Project Director) workshop #3 on Math Anxiety, while the other leader agreed to do workshops #2 and #4 and to assist with the final workshop on Geometry (#6).

Manipulative teaching techniques would be used throughout and problem-solving skills emphasized. All participants would be provided with sets of materials to be used in the workshop sessions, as well as complete master sets that they could take back to their schools, duplicate for their students, and share with other teachers. In several instances, participants requested extra sets of materials for the other teachers who could not attend.

The criteria for all manipulative devices were that they had to be not only attractive to children and appropriate to a fairly wide age-grade range, but also either inexpensive to purchase in quantity and/or easy and readily duplicatable by the ordinary classroom teacher. Furthermore, to the extent that it was appropriate, the materials had to be useful to demonstrate more than one concept or manipulation. (Examples of the manipulative materials used in workshops #2, 4, 5, and 6 is appended. See

Appendix C).

Scripts were developed for each of the sessions. Each included two suggested introductions: one for the live audience and one for the viewing audience ("Opening Scene"). The live introduction usually explained the rationale for the particular workshop--e.g., why do we teach decimals?--and included specific points that the Leader needed to cover (See Appendix D for a sample first outline of a script--the one for "Calculators in the Classroom.")

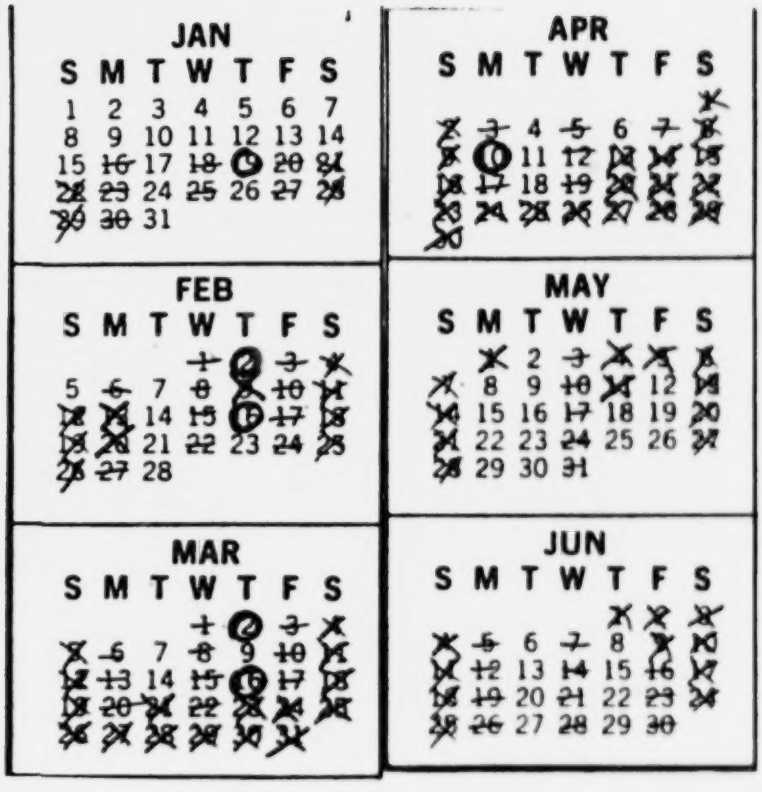
The introduction was generally followed by a discussion of relevant research and/or current typical classroom practices, then by an explanation of the manipulative(s). Next came some introductory or warm-up activities, followed by a series of activities designed to illustrate the major points of the lesson. It should be noted that each workshop covered one to two or more weeks of actual classroom material; participants thus would, at best, gain an overview and some limited practice. Hopefully, this would provide them with the confidence, motivation, and some specific skills needed to introduce the materials to the students in the classroom.

The script thus included the outline, suggested manipulatives, as well as sample (and practice) activities, and, in some instances, supplementary readings and lists of resources and summaries of research.

Workshop and Preparation-Rehearsal Schedule. The six workshops were to be scheduled in the Spring 1989, commencing after the start of the spring term and concluding sufficiently before the end of the school year so as not to conflict with finals and other end-of-year exams.

Since we wanted teachers from schools of all denominations to attend, scheduling had to consider all religious holidays and school schedules, as well as the availability of the consultants and Project Staff. Holding them approximately two weeks apart would give Staff sufficient time to assess one experience and to prepare for the next session; it would also allow the planners enough time to meet together with the workshop leader (and with the videotape production team) to refine the script and rehearse the introduction and order of activities. Mondays and Fridays were to be excluded to the extent practicable, since Mondays are generally not good for teachers to be out of the classroom and Fridays start the Jewish Sabbath; additionally, on Wednesdays public school children receive religious instruction in the NPS and teachers need to be available. This effectively left Tuesdays and Thursdays for meetings.

The calendar on the next page for January-June 1989 shows the workshop dates (the six circled dates), as well as the religious holidays that occurred during that period--noted with an "x." Also crossed out are weekend days ("x") as well as most Mondays, Fridays, and Wednesdays ("-").



As is readily apparent, very few "good" days exist.

Workshops were held on January 19, February 2, February 16, March 2, and March 16 (all Thursdays), and Monday, April 10. Rehearsals took place on the intervening Wednesday afternoons. All workshops took place in the Third Floor Studio of The CUNY Graduate School and University Center in mid-Manhattan. The Studio is a professional studio, complete with audiovisual film and video equipment, that is used to produce quality, professional programs, and which includes the facilities used for all CUNY-TV productions.

Meetings of the production team (which consisted of the Project Director, one or both mathematics educators, generally both workshop leaders, and the video production director of The Graduate School and University Center) were held at the project offices, and included tours of the Studio and control room, as well as at Queens College and Hunter College. Staff also traveled to the leaders' schools to pick up/deliver revised scripts, sample materials, and so on. At least one technical consultant attended all training sessions and at least one came to the actual workshop where she/they acted as resource people.

The entire production team received copies of the workshop outlines and supplementary materials well in advance of the rehearsals. They reviewed these thoroughly and had preliminary discussions by phone or in person. When the team convened as a group for the final rehearsal, the script was gone over in detail and the workshop leader was provided with a hands-on opportunity to work with the manipulative materials that the participants would receive, as well as with the demonstration sets--usually plastic--that are used on an overhead projector. Both leaders also tried out the materials with the students in their classes.

It was our considered decision not to have a more conversational script for leaders but to instead rely on their natural ability to speak before a group and their spontaneity to "fill in the gaps"--that is, to provide the actual words they would say in front of the group (and the cameras.) More often than not, these expectations

were well-realized (although both leaders reported spending a good amount of time at home (and in their classrooms) going over what they would say in whole or in part. Most often, they rehearsed the introduction, and practiced some of the techniques they were less familiar with. In many instances, they gave the materials to their students to try--one of the leaders had these sessions videotaped at the school--and to other teachers to react to. What problems did occur happened as a result of the particular demands of the medium. These were not observable in the live sessions; we will return to this below.

It should also be noted that neither of the leaders (nor participants for that matter) was unduly concerned with the "lights, camera, action"--no special make-up was used, although the leaders were advised about the colors of clothes that would photograph well. Interestingly, as time went on, the participants themselves arrived more "spruced up," frequently wearing clothes of the highly photogenic colors.

The last item we considered involved the plans for the physical configuration of each session: how to arrange the work space, where to set up the chalkboard and the overhead projector, and so on. These decisions were made on the basis of leaders' styles and the workshop content--some topics/manipulatives required a good deal of work space, for example--as well as in terms of the aesthetic need to vary the environment as much as possible to prevent viewer boredom. The video production staff, in conjunction with the Project Director, developed a design plan for each

workshop (see Appendix D).

Holding the workshops every other week allowed Project Staff sufficient time in between to prepare for the next session: to order, print, and duplicate materials[1], to make staff assignments, draw signs, and collect, in quantity, such things as scissors, eye droppers, buckets, etc. to be used in the activities. The schedule also enabled us to view the prior session's videotape and to make those adjustments that seemed warranted.

Conduct of the Workshop Series

In this section of the report, we will describe the six workshops, in order, and include the participants' assessments of each session. Commonalities among the workshops will be described immediately below.

Videotapes. As noted, all sessions were videotaped using two one-hour tapes with a short break scheduled after the first hour. This master videotape was 3/4-inch, professional color tape.

After participants signed in, and prior to the start of the tape, the Director of CASE and the Project Director welcomed the attendees, described the project briefly overall, and detailed the current session, covering goals and objectives, major activities,

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[1] Two sets of materials per participant, at minimum, were made for the attendees: one to use during the session; the other, a master set, for classroom use. In addition, sets of materials were made for non-attendees who requested them.

and outcomes we intended they bring back to their classrooms. Logistics were also discussed, including, of course, the videotaping, and participants' anxieties were dealt with. As we will see in the responses to each session, participants were less concerned with the videotaping than had been anticipated--and, over time, found it to be less and less disruptive. In general, the teachers were more conscious of the bright (and hot) lights than they were of the cameras, cables, or microphones. With experience, we developed some "tricks" (e.g., not turning the lights off at the break) to lessen the lights' effects.

Stationary microphones were placed on the work tables and the group leader wore a lapel microphone. One of the cameras was focused on the leader; the others were trained on the participants. The cameras, all with zoom lenses, were placed on the periphery of the set.

Each session employed three cameras (and three camera operators), a sound person, and a director who selected the view to be recorded and the duration of the shots. In the control booth with the director and sound person was one or both technical consultants, a CASE staff member, other guests, and, at times, the external evaluator. The Project Director and Associate traveled between the floor of the Studio (where the participants were seated) and the control room, offering suggestions to the director and, with the consultants, explaining the priorities of the activities taking place.

The 3/4-inch master tape was used to produce the 1/2-inch tapes for viewing at home and duplicate 3/4-inch tapes for editing. The first set of tapes was time-coded to facilitate the editing process (see below).

(Note that all participants, leaders, consultants, staff, and guests signed a Videotape Release Form for each session. These forms, which authorize the use of the tapes in whole or in part for educational purposes, are filed in CASE's offices.)

End-of-Session Rating Forms. Staff developed a Rating Form, color-coded for each workshop session (see Appendix E for a sample copy), to be filled out by participants. The form was distributed at the end of each session and asked respondents to rate the presenter/presentation on a series of dimensions and to describe the session's strengths and weaknesses. The participants were also asked to indicate specific ideas or materials new to them that they learned about in the workshop and to make suggestions for future sessions. All participants attending each workshop completed a Rating Form.

Workshop Attendance. Total attendance at the workshop sessions ranged from 8 people (workshop #4, Decimals) to 12 teachers (workshop #2, Integrating Math and Science), exclusive of guests. A total of 11 NPS teachers came to workshops #1, #3, #5, and #6. In most instances there were only two "no-shows" (#2, #3, and #6), but five people who were expected at the session on

fractions (#5) did not attend. Since "fractions" was the most popular workshop (with 16 advance registrations), it is possible that the relatively high number of no-shows relate to the very high level of anxiety associated with fractions, both on the part of adult as well as student learners. (The next most popular workshop was Integrating Math and Science with 14 people signed up, followed by Math Anxiety and Geometry with 13 each.)

One school signed up for the equivalent of 12 meetings (two people to attend all six, or 2 x 6) and attended 11 sessions. Another school planned on "10 sessions" and attended the equivalent of eight. A third school was represented at all eight sessions it had registered for, while two other schools had teachers at five of the "seven sessions" they had signed up for. One school was at six of six sessions, one came to four of the six, and another came to only one of the six. Note that had all these schools attended the sessions they registered for, all would have met the participation criterion, which required attendance at the equivalent of three of the six sessions.[1]

Twenty-seven different people (of the 28 who registered in advance) were represented at the workshops, representing 15 of the 16 different schools that had responded positively to the

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[1] The remaining schools registered for fewer sessions in total. Two signed up for five meetings, with one attending all five and one coming to four. One school came to four of its intended four workshops, one came to none of its three, and one planning to come to two meetings did so. Finally, the school that signed up one teacher for one meeting was represented at that workshop.

invitation. With respect to the 15 schools, three schools sent three different people, two people each came from seven schools, and five schools had one representative each.

One person attended all six sessions (100% of thosed signed up for). Two other people came to the five of the six they had registered for, one person came to four of the six, and one person attended only one of the six for which she had enrolled.

The one person who registered for five of the workshops came to them all. Several people signed up for four sessions: two came to them all, one came to three meetings, and one person attended two or half of them.

There were six registrants for three workshops--the minimum number required of participating schools. Four people came to all three workshops, one person came to one, and one person (representing one school) did not attend any sessions. The two people who signed up for two of the workshops came to both. There was a total of nine teachers who registered for one workshop only; eight showed up. Interestingly, no one came who was not registered; this is unlike past experiences where unexpected teachers came at the last moment.

To the best of our knowledge, there was no pattern to the reasons for either the workshops that were registered for, nor for those attended. The reasons for the particular selections often had to do more with personal obligations than with the content of

the session (excepting "fractions," as noted). What is apparent, however, is that to recruit sufficient participants from the nonpublic schools, especially a program that involves more than a single meeting, one must start with a very large base number of schools.

Even setting criteria for participation--which in this case also involved the receipt of a set of videotapes--did not promote higher levels of attendance, suggesting again that the NPS have special problems in releasing teachers to attend staff development meetings during regular school hours.[1]

Below we will describe the six workshops, including the participants' assessments as appropriate. Table 1 on the following page summarizes participants' reactions to select items on the Rating Form--the first question dealing with the reasons why they "liked today's workshop", the overall assessment of the workshop, the question dealing with their level of confidence, and the one pertaining to the disruption resulting from the videotaping.

Workshop #1, Calculators in the Classroom. The first workshop was held on January 19, 1989 at the CUNY Graduate Center. Eleven people, exclusive of the two workshop leaders, the two technical consultants, the videotape production team, Project Staff, and one or two other guests attended.

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[1] The criterion of having half the workshops covered by one or more people (or some other combination) has not been rigorously applied. Sets of the videotapes have been promised to all 15 schools that had a representative at a workshop.

Table 1

Why They Liked Today's Workshop

	Workshop Session						
ITEM (Question 1):	1	2	3	4	5	6	TOTAL
New information.....	62.5	66.6	100.0	66.6	75.5	100	78.45
New ways of presenting...	37.5	75.0	80.0	55.5	87.5	100	72.58
Presenter's knowledge....	50.0	75.0	80.0	55.5	87.5	100	90.27
Interesting material.....	50.0	91.6	100.0	100.0	100.0	100	84.70
Practical ideas.....	75.0	100.0	100.0	100.0	87.5	100	93.75
New ideas.....	87.5	91.6	100.0	88.8	75.0	100	90.48
Motivation/new techniques	62.5	83.3	90.0	77.7	87.5	100	83.50
Clear presentation.....	87.5	91.6	100.0	88.8	100.0	100	94.65
Good preparation/presenter	75.0	91.6	100.0	88.8	100.0	100	92.57
Work with other colleagues	37.5	75.0	90.0	33.3	100.0	100	72.63
New teaching strategies...	25.0	66.6	100.0	66.6	87.5	100	74.28
Made feel more confident..	25.0	33.3	90.0	77.7	50.0	100	62.67
Made feel more professional	25.0	25.0	70.0	55.5	50.0	100	54.25
COMBINED TOTAL	53.8	68.5	93.8	74.3	80.7	100	-----
Overall Assessment (average score)*	3.62	4.41	4.83	4.44	4.63	4.57	4.42
Teaching Confidence (average score)**	3.50	3.75	3.60	4.00	3.43	3.86	3.69
Videotaping Disruptiveness (average score)***	2.50	1.33	1.40	1.44	1.63	1.29	1.60

* 1.0=poor; 2.0=below average; 3.0=average; 4.0=above average; 5.0=outstanding

** 1.0=not confident at all; 2.0=not very confident; 3.0=somewhat confident; 4.0=very confident

*** 1.0=not disruptive at all; 2.0=not very disruptive; 3.0=somewhat disruptive; 4.0=very disruptive

Participants arrived early--some by as much as an hour in advance--while last minute camera/audio decisions were being made and Staff was setting out materials. Refreshments were available as participants signed in and filled out videotape release forms. As they arrived, they were seated. The production director gave the group leader a final briefing. Test pictures were taken and the microphones were tried out. It should be noted again that the workshop took place in the Third Floor Studio (as did all the workshops), a very large, fully equipped recording studio used for professional filming (and also for performances and conferences), accommodating a stage, piano, and seating for 150 people. Work tables were set up in the center of the room. The "front" was the area with the blackboard and overhead projector and screen; at the "back" was the main camera and, overhead, the sound booth for the technical crew and visitors. The set was curtained off on all four sides. As noted earlier, participants' seating was varied. No guests were allowed on the set. (See Appendix D for a sample layout of the set-up used for workshop #1.)

As the title suggests, workshop #1 dealt with the use of calculators in the classroom. The workshop leader began the session by asking what the participants' current practices were with respect to students' use of calculators. Each person got a chance to explain and to introduce her/himself. Following this, the leader described some of the results of recent research.

After about half an hour, the group started working on some

exercises they could use with students. These (see Appendix D) were designed to both engage students' attention (and included some games) and to develop some skills with numbers, including such things as number patterns, estimating, and problem-solving. The activities also encouraged thinking about numbers--especially about large numbers. All participants received two sets of the written materials--one to work on in the workshop and one to use in the classroom--as well as a Texas Instrument Calculator, Model TI-1105, to take with them.

Session Rating Forms from all eight participants were completed and returned. The first question of the Rating Form asked respondents to check all statements (of 13) that characterized the session/presenter (see Appendix E for a copy of this questionnaire.) Combining all statements, the respondents agreed with 53.8 percent of them overall--a smaller percentage than the proportion "agreed with" in any of the other five workshops (See Table 1, Question 1, Combined Total.) Taking each statment by itself, there were three where the ratings were not lowest: the provision of new ideas to try in the classroom (87.5%), the opportunity to work with colleagues from other schools (37.5%), and the belief that the workshop had made them feel more professional (25.0%). The ratings were also relatively high for clarity, preparation, and practicality.

The Combined Total score notwithstanding, the participants' comments indicated a high degree of satisfaction with the first workshop. For example, one teacher said, "[the leader] was enthus-

iastic and the workshop 'flew by'". Another felt that "the workshop was presented in a professional practical way. By the end of the session I was excited over having a learning experience--my main criteria for my students." And one person indicated that "many workshops I have attended I have not found worthwhile. This was one where I really came away with something useful."

Table 1 (page 31) shows that 7 out of 8 people (87.5%) considered the presentation clear. Seventy-five percent (6 out of 8) agreed that the presenter was well-prepared, and that the ideas presented were practical. Five out of 8 (62.5%) indicated that they had received new information, and were motivated to try some new techniques. Five people described specific ideas or techniques they learned from the session, including the "development of the determination of patterns", and that "the calculator can remove the tedium from computation once the basic math facts have been mastered by the students." The material was considered interesting by half of the respondents.

The overall assessment of the workshop (average score) was 3.62 on a 5-point scale, between "average" (4.0) and "above average" (5.0). This was the lowest overall assessment given to any of the six workshops, possibly because it was the first in the series and participants didn't know what to expect, or because the topic was inherently the most controversial. Alternatively, the relatively low overall assessment may have come about because the

relationships between and among participants, staff, and consultants had not yet fully developed, although as one person commented, "I find it stimulating to be with others who also love math. As the only 'math' specialist in my school, this revitalizes me." The three people who had suggestions for improving the workshop wanted more information on calculators in the "higher grades," more on how to use calculators for "teaching multiplication facts," and more details for how calculators could meet students' needs for "remediation--how it could be of use to slower students."

As a result of the workshop, however, the participants were quite confident about introducing calculators into a math lesson. The total average "confidence" score was 3.5, between "somewhat confident" (3.0) and "very confident" (4.0) on a 5-point scale. They also reported renewed interest in having students use calculators, although they remained very concerned about when in the learning process calculators should be introduced.[1]

Finally, it should be noted that this session had the highest average score (2.5) of any of the workshops with respect to the disruptiveness of the videotaping. It was rated between "not very disruptive" (2.0) and "somewhat disruptive" (3.0), on a scale where 4.0 meant "very disruptive". One of the respondents said she

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[1] In subsequent discussions with some of the teachers who took part in this workshop, we were informed that they did indeed try some of the activities with their students and were quite impressed with the results.

would prefer to work without videotaping because she felt "inhibited in front of a camera."

Workshop #2, Integrating Math and Science (February 2, 1989) was also designed as a "modeling" experience whereby participants would engage in those same activities that they could lead their students in. All activities in this and all workshops were selected to be of interest to students and appropriate for a fairly wide age-grade range of about grades 3 to 6.

In terms of materials, this workshop utilized the most and most varied in the conduct of several science demonstrations/experiments. In addition to the print materials (see Appendix C for a sample), of which each participant received two sets, each teacher also got (in sufficient quantity to take home), plasticene modeling clay, toothpicks, and thread; paper strips of two weights; a set of paper strips of different composition, a plastic dish, and food coloring; and tape and scissors. Each group of two people shared liquid detergent, a large bucket, a pitcher of water, a bag of chocolate chip cookies, an eye dropper, measuring scale, string, a 6-inch ruler, and newspaper and paper towels.

Following the leader's introduction, which dealt with levels of thought processes and how science and math are related in everyday life, the 12 participants undertook five different science experiements: whirligigs, paper as it falls through the air, absorbancy rates of different papers, geo-panes, and a set of activities involving different brands of chocolate chip cookies.

All of these experiments involved basic mathematical concepts and, additionally, made use of observation forms, charts, and graphs for recording, summarizing, and analyzing data.

This was the most active workshop, and involved participants in cutting, building geometric shapes, measuring and weighing, estimating and predicting, observing, and so on. The noise level was also high as the teachers got into the tasks. (Noise in the classroom was a concern to participants that permeated the use of all manipulative devices and hands-on strategies. Almost without exception, they spoke to this issue, expressing quite a bit of trepidation that principals would not understand and might interpret noise as indicative of a class out of control.)

As with the other workshops, refreshments were available at the beginning and during the session, there were early and late arrivals, Project Staff and the videotape team set up the Studio prior to the teachers' arrival, test audio and video footage was shot, the leader was briefed and given last minute suggestions, and the technical consultants worked with the videotape director in the control room.

As noted, this workshop took place on February 2, 1989. Rating forms from all 12 participants were completed and returned. Overall, with respect to the combined total of Question 1 (see Table 1, page 31), the respondents agreed with 68.5 perent of the statements (of a possible 100%)--i.e., 12 x 13, or 156 if all

people had agreed with all statements.) This indicates a high level of agreement, substantiated by their level of overall satisfaction, and reflected in the workshop's overall assessment (see below) and in their open-ended comments. These comments included, "it gave me ideas on how to present new material in an interesting manner"; "I experienced new and more exciting ways of making science and math more enjoyable for the kids and for myself in ways that fear would be eradicated from the minds and attitudes of the children"; "the presentation was well prepared and professionally offered. Plus it was fun. Lessons could be applied to most age groups"; "the session was very informative"; and "the activities taken up during the session were inquiry-oriented and designed to emphasize, clarify, and reinforce new concepts related to math and science skills."

As can be seen in Table 1, all of the respondents (100%) considered the ideas presented to be practical; one person said, "I feel like I learned new practical ideas." Also, all of them agreed that the presentation was clear, and that it had given them ideas to try in the classroom: it was, in the words of one participant, "a good combination of explanation and 'hands on'." Almost all, 91.6 percent (11 of the respondents), agreed that the presenter was knowledgeable and well-prepared, and that the material was interesting. Ten people (83.3%) considered that the presentation had motivated them to try some new techniques. They said, "it motivated me to using team-teaching with science colleagues"; and "it helps to make the skills of the science curriculum presentable to a class in an easy everyday manner with everyday materials."

One-third of them said the workshop made them feel more confident, and 25 percent felt more professional.

The overall assessment of the workshop (average score) was 4.4, between "above average" (4.0) and "outstanding" (5.0) on the 5-point scale. Almost all of the respondents (11 out of 12) specified the reasons or factor underlying their overall assessment. Some appreciated the "many ideas on experimenting without complicated equipment." Only one respondent provided information as to how to make the session better: that is, by providing more information about "science topics with math connections on upper grade level".

Three-quarters of the respondents described specific ideas or techniques they had learned as a result of the workshop. These included learning about "the correlation between the edges and the 'soap-faces' of the 3-dimensional figures"; "how to get higher-level skills across [to students] by counting chocolate chips in cookies"; how to demonstrate "information on air resistance." They also became more aware of the science and math possibilities in everyday situations: "using everyday materials for experiments", and "using common materials (e.g., cookies) to work with--using toothpicks and clay to build 3-D geometric models and using soapy water to see 3-dimensions."

Their average level of confidence with respect to being able to integrate math and science in the classroom was 3.75, between "somewhat confident" (3.0) and "very confident" (4.0), the highest

scale value. They felt that the workshop's activities not only incorporated "important problem-solving skills", but that the activities also developed a positive classroom climate."

With respect to the disruption produced by videotaping the session, the average rating was 1.33, between "not disruptive at all" (1.0) and "not very disruptive" (2.0). No suggestions were made for videotaping future workshops.

Workshop #3, Math Anxiety. The workshop on Math Anxiety, led jointly by one of the teachers and the Project's Director, took place on February 16, 1989. This was the third in the series, but in the future, might be repositioned in first place since it deals primarily with the participants' attitudes and feelings about mathematics.

This was the only workshop in which there were no manipulative materials. As before, however, sets of print materials were available (see Appendix D). These were of two kinds, the first those having to do with math anxiety--sample copies of the "Mathematics Anxiety Rating Scale", cartoons about math anxiety, and math myths and newspaper clippings. Also included were activities designed to teach finger multiplication and how to "cast out nines."

The first hour after the preliminaries (welcome, greetings, and signing in and the serving of refreshments) was devoted to an

exploration of participants' feelings about mathematics. Without notice, the leader announced a surprise "test" with a tight time limit, numerous problems, and other details designed to heighten anxiety. This situation was purposely constructed to help teachers understand their own reactions and those of their students.

This led into a more formal discussion of the antecedent causes of math anxiety as well as a discussion of some things teachers could do to avoid intensifying students' negative feelings. Following the break, the co-leader talked about some very specific things she does in the classroom in dealing with highly anxious students. She then went into a demonstration of finger and lattice multiplication and of how to check multiplication by casting out nines. Workshop rating forms were completed by the attendees, all of whom indicated that this was a very well done session.

Of note is the fact that respondents agreed with 93.8 percent (of 100%) of the 13 statements comprising the first question--indicating that this was the second most positive workshop experience of the six based on this measure, although this session received the highest overall assessment (see below).

All (100%) of the participants agreed that the presenters were knowledgeable and well-prepared, that the ideas presented were practical, and that the presentations were clear. Also, all attendees indicated that they received new information and new ideas to try in the classroom, and that they had learned additional

teaching strategies. They said such things as it was "professionally done", "it was super!"' "I was particularly impressed with the practical suggestions"' and "I received information that is very valuable for the classroom."

Nine out of 10 people said that the presentation made them feel more confident, more motivated to try some new techniques, and that the workshop provided them with an opportunity to work with colleagues from other schools. One person indicated that she "definitely would introduce some of the new techniques that were taught today." Others received much needed confirmation for their own feelings, explaining that "[I was] put at ease--I felt one of the group, not an outsider"; "I feel more confident about the things I already do"; "the workshop helped me with my own math anxiety"; and "the stimulation generated was, in my opinion, far above the 'anxiety' anyone experienced". Their feelings about their students' experience were also confirmed: "What I have learned today makes me feel more confident in introducing a new technique to the students without making them feel nervous", and "I realized how my students feel and how I would deal with them differently."

Forty percent of the respondents gave additional reasons for liking the session. Among them were realizing that "students should not be taken for granted; we have to start where they are"; "the workshop helped me with my own math anxiety"; "I feel more confident about the things I already do"; "I am really thrilled

with the finger multiplication"; and "I loved the cartoons."

As noted, the overall assessment of this workshop (average score) was 4.83 (the highest rated of all workshops), with scores rating from "poor" (1.0) to "outstanding" (5.0). Almost everyone specified the reasons underlying their overall assessment. Some of these were cited above and other reasons included "I learned new methods; I was encouraged to use new and 'old' methods." It is important to note that the finger multiplication and lattice multiplication were particularly well received.

Three people made suggestions for improving the session. In their opinion, it would have been better if more information had been included about "what each other does" [i.e., what the teachers actually do in their classrooms]; if it had included strategies for "teaching 23 children who have learned to hate math and 'act out'"; and if participants had "had more opportunity to practice different methods."

Nine people listed specific ideas or techniques they had learned as a result of the workshop. Lattice and finger multiplication were singled out for praise, and "casting out nines (9's)" was also mentioned. Most people talked about feelings.

When asked to rate their level of confidence (after the session) in dealing with math anxiety in their classroom, the group averaged 3.6, between "somewhat confident" (3.0) and "very confident" (4.0). They gave the same rating to the question

dealing with their own feelings of math anxiety. (See Table 1, page 31.)

Their assessment of the disruption caused by the videotaping was 1.4 (average score), which is between "not disruptive at all" (1.0) and "not very disruptive" (2.0).

Workshop #4, Decimals, scheduled for March 2, 1989, was led by the teacher from St. Anthony School. Materials for this workshop consisted of grids and squares (1 unit measures) and rectangles (10 units) on heavy, colored paper; scissors; and a package of print activities. We also provided scrap paper and pencils, tape, and envelopes. (See Appendix C for a sample set of the materials participants received.) The leader had a similar set of materials constructed out of sheets of colored transparent paper for use on the overhead projector.

The session began with a discussion of why we teach decimals, emphasizing their occurrence in everyday life. Next came an overview of what was going to be covered in the session, including such topics as naming, ordering, comparing, rounding, equating, and addition and subtraction. Participants then began the first activity which involved working with tenths. Following this, the teachers went on to work with hundredths and then on to rounding, problem-solving, and adding and subtracting. All work, even the "easiest" problems had to be completed using the manipulatives. Like the prior workshops, this one was completed with a summary and

the distribution of the Rating Form.

(It is important to keep in mind that, as exemplified by all the materials used in all the sessions, the materials we selected met the criteria of being very inexpensive--if commercial sets were purchased--or, and as was more usual, easy and inexpensive for the teacher to construct. In some way, by demystifying the materials, it becomes more likely that they will be used in classrooms than would be elaborate and expensive manipulatives.)

Respondents agreed with approximately three-quarters (74.3%) of a possible 100% positive statements (Question 1) indicating what they liked about the fourth workshop. All felt that the presenter was knowledgeable, and that his ideas were practical. One person said that he was an "excellent presenter"; and another indicated he "presented decimals in a more concrete manner". A third summed it up by saying "Mr. __ is ... knowledgeable in his professionalism and extremely helpful due to his experience as a present teacher in the classroom. His understanding of the students and their needs flows [from] his instruction."

All but one participant considered the leader to be well-prepared and felt that he had provided them with new ideas to try in the classroom: "As usual, new and useful information techniques were presented in an interesting and enjoyable manner"; "Concrete suggestions will be helpful in my teaching. I definitely will try these ideas." Seventy-seven percent of the participants felt more confident about teaching decimals as a result of the workshop,

which also motivated them to try some new techniques. One-third believed that this session provided them a good opportunity to work with colleagues from other schools.

The overall assessment of the workshop averaged 4.44 between "above average" (4.0) and "outstanding" (5.0). All of the participants specified underlying reasons for this rating: "the speaker was very detailed and orderly in his manner of presenting the topic", "the workshop was very clear and informative, and creative as well", and "I feel that hands-on materials help to make math instruction very clear and easy to understand even for those who find the subject difficult."

Only one respondent had any suggestions for improving the presentation. He said the session would have been better if more information had been provided about "the powers of ten", and if it met his "needs for dealing with slow and quick learners in the same class." Another person would have liked more about operations involving decimals, while a third participant asked for more emphasis on introducing decimals through the use of money.

Most of the respondents listed a specific idea or technique learned in the workshop. These included "using grids and graph paper to teach several concepts--re: decimals", "using overhead projector and hand-made strips and units", and "using the tape measure to explain decimals." As indicated, the use of simple, readily accessible materials (manipulatives) was noted over and

over.

On average, participants were highly confident (after the session) about teaching decimals to the children in their classes. All indicated a "very confident" level (4.0) on the scale where a "4.0" was the highest value (see Table 1.)

The videotaping tended to become less and less disruptive, averaging 1.44 for this session (between "not disruptive at all" (1.0) and "not very disruptive" (2.0)). One person said that videotaping the workshops was "a good idea", but that the lights made the room very warm.

Workshop #5, Mastering Fractions, took place on March 16, 1989 in the Third Floor Studio at The CUNY Graduate Center. The master teacher from SAR Academy led the session at which 11 (of an anticipated 16) teachers participated.

The manipulative materials used in this workshop included sets of fraction pieces. Printed on heavy construction paper of various colors, these included whole circles as well as circles divided into halves, thirds, quarters, fifths, sixths, eighths, tenths, and twelfths. Each person received a set to cut out and work with in the meeting, as well as a set to use as a master model for students.

As before, as teachers arrived they registered and signed a Videotape Release Form, partook of refreshments, and seated

themselves around tables comprising the day's set. They were welcomed by the Project Director who was followed by the leader. She talked first about why we teach fractions (especially in light of the use of calculators). She then went on to discuss the vocabulary and concept of fractions.

Participants were then engaged in dialogue about what teachers cover with respect to fractions: unit fractions, fraction names, equal or equivalent fractions, comparison of fractions, and proper and improper fractions, and so on.

Using their fraction pieces, the group investigated unit fractions. The next activity involved naming fractions and had teachers generate different fractions as well as making and naming larger and smaller fractions.

This was followed by activities dealing with the concept of equivalent fractions. After that, the group compared fractions of various sizes. In the next activity, the students worked with fraction pieces to demonstrate fractions larger than one. They then went on to adding and subtracting fractions using like denominators and adding and subtracting fractions using unlike denominators. The last activity before the summary involved problem-solving.

The eight people who attended this session rated it highly, agreeing with positive statements about the presenter/presentation

80.7 percent of the time (i.e., the number of possibilities making up positive statements in question 1--8 x 13 possible instances of agreement); see Table 1, Question 1, Combined Total.

All of the respondents (100%) felt that the presenter was knowledgeable, well-prepared, and that the materials were interesting. They said things like, "The presenter was very informative," "The presentation was really overwhelming and amazing," and the "combination of theory and practice was well presented." Furthermore, they thought that the presentation was clear, and felt that they had had an opportunity to work with colleagues from other schools. Almost everyone heard some ideas presented in new ways, learned practical things and additional teaching strategies, and indicated that the workshop had motivated them to try some new techniques. As one person said, "The topic was presented very clearly. It gave me terrific, practical ways for presenting this material." Another teacher said, "I found the ideas to be a wonderful teaching tool." Still another person indicated the "importance of hands-on fraction pieces" for "teaching concepts" and for teaching adding, subtracting, and changing unlike denominators." Three-quarters of the attendees were positive about the new information they received and felt that the workshop did indeed provide them with new ideas to try in the classroom.

The overall rating of the workshop (average score, see Table 1 on page 31) was 4.63, near "outstanding" at the top of the 5-point scale. As one respondent put it, "Teaching fractions with fraction pieces in the early grades especially would give the students basic

skills in fractions for the rest of their lives." Everyone specified the reasons underlying their assessment, supporting the excitement fraction pieces generated in the participants. There was unanimity that this manipulative is "a wonderful teaching tool."

Only two respondents had ideas for improving the session. One wanted more information about "simplifying" fractions and the other wanted additional demonstration of how the manipulatives should be used for subtraction and addition.

Five out of 8 people (62.5%) listed the ideas or techniques they have learned, including the "use of manipulatives to introduce fractions", "improper fractions", "addition and subtraction"; and "the use of fraction pieces for teaching such things as adding, subtracting, and changing unlike denominators."

Participants left the session feeling confident about using manipulatives to teach fractions to the children in their classrooms. The average score was 3.43, approximately midway between "somewhat confident" (3.0) and "very confident" (4.0) on the 4-point scale.

Participants wanted more time devoted to "simplifying" fractions and for multiplication and division. The one participant again asked for more emphasis on the upper grades. Otherwise, no suggestions were made for improving the workshop.

As time went on, the intrusiveness of videotaping the work-

shops decreased still further; the average rating for "disruptiveness" was 1.63 for this session.

Workshop #6, Geometry, was attended by 11 teachers from the NPS who came to a workshop held on Monday, April 10, 1989. This last meeting was led by the teacher from the SAR Academy, assisted by the teacher from St. Anthony School.

There were two types of materials (in addition to the print activities) used in this session: Tangrams and Five Easy Pieces. We provided participants with two sets of each (one to use as a model), prepared on heavy-stock, attractively colored paper.

By the sixth workshop (at which there were no newcomers), all participants were familiar with the preliminary routines. Once they were seated and welcomed by the Project Staff and technical consultants, they began to discuss geometry and its applications in everyday life and how geometry often appeals to just those students with a dismal history in algebra, fractions, etc.

The group went through a series of exercises using the various Tangram pieces. They constructed different-sized geometric shapes, interchanging pieces and building on to shapes already made. In doing so, they discussed such concepts as equality, congruence, and similarity and equivalences. They next engaged in using the Tangrams to form different shapes--activities that children would find especially motivating--including the standard paradox puzzles.

The Tangrams were also used to explore right angles, straight angles, and the number of degrees in a circle.

The next set of activities involved the use of Five Easy Pieces. These materials were used first to talk about area and about how any shape can be divided into smaller, different shapes. Following this, the manipulatives were used to solve problems in logic, to do "puzzles," to make patterns, and to find area. As with the Tangrams, the leader used a set specially-designed for the overhead projector, while all participants completed the exercises on their own.

The Rating Forms indicated unanimity that this workshop was highly successful. (All respondents agreed with all (100%) of the statements comprising the first question. This was the only incidence in which everyone rated the session positively on 13 dimensions.) Their open-ended comments included the following: "As usual, the presenters were well-prepared, knowledgeable and allowed a comfortable atmosphere for the exchange of ideas," "The workshop was presented in a very enjoyable manner with basics and problem-solving and puzzles. It's excellent," and "She put people at ease; she is well-prepared and knowledgeable."

Two people were very excited about the session, one saying, "It made me feel very confident to continue teaching geometry." Another expressed her delight by telling us, "It made math easier to understand and fun."

The average overall rating of the workshop was 3.86 (between "above average" (4.0) and "outstanding" (5.0) confirming the participants' enthusiasm and gains. All took time to specify the reasons underlying their rating. These summary statements indicated that "geometry was made to come alive, the students would open up and get satisfaction from the results"; "the workshop has given me more insight to make the teaching of geometry more interesting"; and "I never realized that the teaching of geometry can involve so many activities; the activities make geometry easier to understand as well as enjoyable."

One respondent suggested a need to also "approach geometry from a different 'angle'"; and another person felt the session should have emphasized "more concepts."

All of the respondents noted specific gains in terms of ideas or techniques learned as a result of the workshop. Among these were: "how to use manipulatives better", "how to use geometry to help teach logic", and "finding area of space--square, triangle, etc..."

The workshop contributed positively to participants' feelings of confidence in terms of teaching geometry to the children in their classes. The average score was 3.86, between "somewhat confident" (3.0) and "very confident" (4.0). One person stated that "it made me feel very confident to continue teaching geometry."

The disruptiveness of the videotaping was 1.29 (average score) which falls between "not disruptive at all" (1.0) and "not very disruptive" (2.0). Again, the heat generated by the lights was singled out as a negative factor, but overall, the videotaping per se was not experienced as disruptive or intrusive.

In summary, looking at all six workshop sessions, the average number of participants per workshop was 9. The largest number attended workshop #2 on Integrating Math and Science (12 people), and the fewest people came to workshop #5 on Fractions (8 people.) There does not seem to be any relationship between the attendance patterns and the assessment of the session; attendance probably has to do more with the topic (session #2 drew both science and math teachers, for example) and with the date (that is, the time of year.)

Overall, respondents agreed with an average of 80.37 percent of the statements composing the first question. In 94.65 percent of the instances, participants felt that the presentations were clear; 93.75 percent of the time, the respondents believed that the ideas presented were practical; in 92.57 percent of the possible options the presenters were found to be well-prepared; and 90.48 percent of the time, the attendees felt that they had obtained new ideas. In general, the workshops were less likely to make respondents feel more professional; in only about half of the instances (54.2%) was this indicated. However, it should be noted that these sessions were intended to present new and practical ideas for the teaching

of math.

Over all workshops combined, the average assessment of value of the sessions was 4.42 (on the 5-point scale where 4.0 is "above average" and 5.0 is "outstanding".) Workshop #3 (Math Anxiety) received the highest assessment (4.83), and workshop #1 (on Calculators) the lowest (3.62).

In almost every case, participants were able to describe the reasons underlying their overall assessment. In general, respondents seemed to be most impressed with the preparation of the presenters, the use of manipulatives, and, importantly, the fact that the manipulatives were accessible--could be teacher-made.

There were very few suggestions for improving the sessions and most of these concerned the interests of one or two people for more information on teaching math in the upper elementary grades.

Most respondents specified particular ideas or techniques they learned as a result of attending the workshop. Workshops #6 and #3 produced an especially high percentage of such responses. It is interesting to note that people obtained a very wide range of ideas--from the very detailed to the more general. In addition to the math-related responses, which accounted for almost all responses, participants also liked meeting other teachers and working together and becoming more aware of the importance of math (and science!) in the everyday world.

The participants' confidence level (after each workshop) with respect to teaching the subject presented was 3.69, between "somewhat confident" and "very confident" (4.0), the top of the scale. Workshop #6 was highest in this regard (3.86), and workshop #5 the lowest (3.43). The relatively low rating for "Fractions" (#5) may reflect the fact that fractions continues to be the single most troublesome concept for most adults, including the elementary school teacher.

Finally, videotaping was essentially not a problem for participants. The average "disruptiveness" rating for all six workshops was 1.60, between "not disruptive at all" (1.0) and "somewhat disruptive" (2.0). The first workshop was rated highest on this, and the last workshop was rated the lowest--strongly suggesting that people became accustomed to the cameras, lights, and cables.

This completes the description of the activities that comprise the major phase of this year's project to conduct workshops to improve the quality of mathematics instruction in the NPS elementary schools. The next section of the report describes the production of the videotapes.

Production of Prototype Videotapes

Below, we will outline the procedures used to assess, review, and edit the videotapes and to produce and test the final versions. It is important to keep in mind that the workshops were intended to

have a dual function: to be, first, the project's major instructional strategy and, second, to represent the project's major delivery strategy. In other words, at one and the same time, participants at each workshop were expected to both develop new attitudes about mathematics and practice new math skills, and take part in an interactive environment for the purpose of creating a videotape that other teachers could use.

First-stage editing. The editing of each videotape proceeded in two stages. The first stage involved eliminating extraneous, inaccurate, and unimportant and repetitious material from the original raw footage. Two hours of "live" tape was filmed for each workshop. These master tapes were used to produce a set of 3/4-inch, timed-coded work tapes (hereafter, the time-coded tape (I)) which were the tapes used for the first rough cut[1]. The production director and Project Director reviewed the master tape after each workshop; this first viewing, which, with interruptions, consumed four or more hours, was primarily for the purpose of planning the next workshop--deciding on camera angles, arrangement of the set, suggestions for the leader, and so on.

Each two-hour time-coded tape (I) was then reviewed by the Project Staff who worked with a portable 3/4-inch VCR and monitor. Although this particular VCR had a fast forward, rewind, pause, and

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[1] Time-coding refers to the inclusion of a "clock" inserted onto the tape, recording the time in minutes, seconds, and "frames" so that any point on the tape can be precisely identified.

stop mode, the equipment was not designed for professional editing, but was adapted to this purpose. Viewing two hours worth of tape to identify those portions to be eliminated actually involved approximately 30 hours of work time: to play the tape through, then to start, stop, and replay the tape and note the time-code of the beginning and end of the segment to be cut, as well as the actual words being spoken at the start and finish of the cut segment. It is a tedious, time-consuming task requiring concentration and attention to detail, as well as memory of what was included on the tape.

To assist in this first-stage editing from the time-coded tapes (I), the Project Director had copious notes the technical consultants made in the control room during the workshop as they viewed the filming on the monitors along with the production director. However, these notes did not have time-code referents and, thus, had to be laboriously integrated into the editing process.

In producing the first-stage edited tapes (II) from the time-coded tapes (I), the Project Director had to keep in mind not only the consultants' notes, and the content of the entire tape, but also had to consider good pedagogy and aesthetics. For example, techniques that work well in real-life situations often do not photograph as effectively. Similarly, things that pass unnoticed during the workshops are exaggerated on screen. Such things as leaders' "nervous habits" and excessive pacing assume undue importance in film. Also particularly troublesome is the way

people speak in conversation: half-thoughts, incomplete sentences, and body language frequently convey intended meaning. On film, however, these things are not necessarily interpreted in the same way. In addition, there are other technical problems that had to be addressed including poor camera angles, for example, and inaudible video.

Once the time-coded tapes (I) were reviewed by Project Staff, the notes to the technical editor (including the start-stop time codes and words and video images of the to-be-cut segments) had to be codified. These notes often ran to 20 to 30 pages per workshop, depending on the number and complexity of the desired editing.

The technical editor, using professional editing equipment, then produced a set of first-stage edited tapes, II. These tapes, too, were time-coded and averaged about one-hour in length, indicating that we had eliminated approximately half of the material. Editing of each tape took approximately 40 hours. Each first-stage edited tape II incorporated all the available footage that staff believed relevant to the particular topic. Each also included more material than needed, both substantive and non-substantive material. The substantive material relates to such things as the number of examples that are needed to illustrate a concept or technique; the non-substantive materials include, as an example, the length of time needed to show participants working at a particular activity.

It should also be kept in mind that each tape II is a

compilation of uncoordinated events, often strung together without appropriate transitions and/or explanations, some of which were eliminated for (other) good reason in the first editing. It cannot be emphasized too strongly that what works in real situations is not necessarily effective on film. Producers of documentaries know this and, when possible, shoot hundreds of hours times more footage than they need for the finished product.

Sample tape II's were tested with several audiences similar to the target NPS. First, one tape (of Workshop #3, Math Anxiety) was shown to all the counselors in one public school district in New York City. The purpose of the viewing was to assess whether the tape could convey the level of anxiety that many adults and young people experience when confronted with the need to do math problems; and whether the tape could stimulate the kind of discussion about math anxiety that would lead to better understanding of the phenomenon as a preliminary to dealing with it.

The Evaluator observed this situation and, based on her feedback, felt that this tape did indeed produce the desired results. (See Appendix A.) A great deal of discussion and interaction was generated and the counselors produced plans for follow-up in their schools. Subsequently, the Project Director received calls from the schools requesting assistance in setting up staff development and student-centered math anxiety programs. We were informed that other schools were also considering activities dealing with students' negative feelings about mathematics.

Final revisions. The final revisions of the tapes will be based on the reactions of Project Staff and consultants and on the feedback of selected NPS teachers. Each tape will be approximately 30-45 minutes long and, in addition to the material from the actual workshops, will incorporate all necessary new material.

This new material is currently being produced. It involves identifying introductory, transitional, and summary points on the tape and producing needed audio/visual materials to fill these gaps. These include voice-overs (using the voices of the leaders and/or other people), print, and additional activities using the overhead projector and the demonstration sets of manipulatives. An introduction will also be required for each tape, as will be end credits. Moreover, each new activity that is presented will also need to be introduced; in some instances, there exists actual filmed workshop segments that can be used. But in many cases, as a result of the way group discussion flows in real-life, additional introductory materials will have to be created. This, like the general introduction and credits, can consists of voices speaking over the video images, scrolling printed over the video images, and/or videos of printed "still" messages. All options, however, involve developing the actual wording. In addition to introductions, summaries, and transitions will also have to be designed and will consist of essentially the same alternatives.

Overall, the project has proven to be effective, especially in terms of the effects of the workshops on the participating teachers and schools. As the Evaluation Report indicates, the teachers were

very enthusiastic about their experiences and all had or were planning to incorporate these into classroom practice. They reported increasing the use of calculators by their students, and using the fraction pieces and grids and unit pieces and Five Easy Pieces for geometry. According to one participant, with these manipulatives, she actually began to teach basic geometric concepts to her class for the first time.

Interest in the project on the part of select principals also appears to be high. They, like all teachers this year without exception, are interested in securing copies of the videotapes for other teachers and, in some instances, to show to students. They have offered their assistance in assessing the tapes and accompanying guides and suggestions for use, and in making sure that they are seen by all teachers in the school.

Producing videotapes is an expensive, time-consuming, and complex task. We underrated the impact on staff time in the original planning and could not account for all the technical problems that have arisen. The major difficulty that the project has encountered, and the only aspect that has been a problem[1] -- interestingly, the aspect that we had expected to be one of the

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[1] One large, unforeseen problem was a flood in the Project Director's office over the June 2, 1989 weekend. Caused by malfunctioning air conditioning in the office upstairs, the ceiling collapsed during the weekend, soaking the Project Director's desk containing the editing notes and the VCR equipment. This was a serious set-back for the project.

project's great strengths--was the decision to have the workshops serve a dual function--to be the major forum for staff development as well as the "set" for the videotapes. During the year, and in the planning and preparation that took place all along the way, the main emphasis and guiding principle was that the participating teachers have a real experience. The Project Director stressed this over and over again and it affected all decisions from the arrangement of furniture, to the selection of manipulatives, to the orientation and coaching of leaders, to the instructions to the camera crew and production team.

Unfortunately, these needs were often antithetical to producing high-level videotapes. Such production usually requires word-for-word scripts (we wanted--and got instead--the spontaneity of group dynamics), pre-assigned placement of actors, "stop action" to rerecord or pick up specific activity, and so on. To ensure that our participants would come away from the workshop with the same experiences as if there was no videotaping meant that many standard cinematic procedures could not be employed. It also involved retraining the camera people and production crew to be unobtrusive. People who make documentaries based on live material, as noted above, obviate these factors by shooting a very great amount of extra footage. What we may have sacrificed in cinematic terms, however, we made up for in participants' feelings of ease, comfort, and accomplishment.

APPENDIX A

EVALUATION REPORT

NONPUBLIC SCHOOLS MATHEMATICS PROJECT

"DEMONSTRATION OF A DISTANCE LEARNING APPROACH TO

QUALITY MATHEMATICS INSTRUCTION IN THE NONPUBLIC ELEMENTARY SCHOOLS"

SUMMARY EVALUATION REPORT, 1988 - 1989

Prepared by

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July, 1989

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NONPUBLIC SCHOOLS MATHEMATICS PROJECT, 1988 - 1989

"DEMONSTRATION OF A DISTANCE LEARNING APPROACH TO QUALITY MATHEMATICS INSTRUCTION IN THE NONPUBLIC ELEMENTARY SCHOOLS"

SUMMARY EVALUATION REPORT

I. INTRODUCTION AND PROGRAM OVERVIEW

CASE (Center for Advanced Study in Education), of the City University of New York Graduate Center, continued work to improve mathematics instruction in selected nonpublic religiously-oriented schools, during the school year 1988-1989, with funds from a fourth New York State Education Department grant. The proposal received the highest single award made in the State under EESA/Title II funding for the 1988-1989 school year.

During the first year of project operation (1985-1986), extensive staff development for teachers and administrators in grades 5-9 was provided through in-service mathematics courses, school visits, and seminars.

The second year's program (1986-1987) provided a more limited staff development and training model, which offered two on-site options to participating schools, i.e. individual work with one or two interested teachers, with classroom observations followed by consultation and discussion concerning the teacher's lesson; or group work with mathematics teachers in a workshop setting to conduct an informal demonstration of teaching methods and techniques applicable to various elementary-level mathematics concepts and curriculum issues.

Funding for the third year's proposal (1987-1988) represented the single largest EESA Title II grant awarded. This program consisted of two parts (Fall 1987 large-group presentations, and Spring 1988 small-group workshops) for the purpose of giving mathematics teachers in grades 4, 5, and 6 specific, "hands on," and practical experiences.

Each of the four programs operationalized from school years 1985 through 1989 have sought diverse creative and innovative ways to present strategies and techniques for teacher use in improving mathematics instruction in the middle grades of nonpublic, religiously-oriented school systems. Projects for these four school years have all focused on enhancing teacher performance in the classroom; programs for the school years 1985 through 1987 formed a sequence, which moved developmentally from year to year and culminated in the third and final one. It was indicative of the Project Director's leadership and foresight that the September 1987 Advisory Committee's agenda included the issue of new project ideas. It is significant, therefore, to note that the current year's project explored a different dimension of teacher training - videotapes as staff development tools - using a three-stage approach:

- o Planning;
- o Training, and
- o Refining and Dissemination.

It should be noted, also, that this year's project made maximum use of input, advice, and counsel of cooperating nonpublic school agencies and school systems for program planning, implementing, referring, and evaluating based extensively on an expanded Advisory Committee. Cooperating groups involved in the project were:

- Agudath Israel of America;
- Board of Jewish Education of Greater New York;
- Catholic Archdiocese of New York;
- Catholic Diocese of Brooklyn;
- Greek Orthodox Archdiocese, and
- National Association of Episcopal Schools.

During the 1988-1989 year of operation, approximately 68 nonpublic school teachers in grades 3 through 8 participated; women (80%) outnumbered men (20%) greatly; almost all (98%) indicated a mathematics discipline, with a small representation from science backgrounds (2%).

The purpose of this Summary Evaluation Report is to describe the process and procedures utilized to implement this current project, and to assess the effectiveness with which goals and objectives were met. As indicated in the Project Director's Interim Report, the project

> "seeks to broaden the mathematical knowledge of elementary school teachers and their understanding of mathematics concepts and operations; improve their attitude and receptivity toward adopting new classroom

techniques and strategies; and increase the access of nonpublic school children ... to quality instructional opportunities by means of vidotape demonstrations - a delivery strategy that has the potential to overcome many of the barriers inherent in the small size and geographic spread of nonpublic schools generally." (p. 1, 12/88)

An outline of project activities, which appears on the following page, lists three specific program objectives:

"A. Involve NPS teachers in the planning and creation of mathematics training videos that can be used by individual teachers and by groups concerned with mathematics pedagogy;

"B. Provide teachers in live seminars with information about the elementary math curriculum, and

"C. Demonstrate the usefulness of video as an inservice teacher training tool that overcomes the barriers of small numbers, diverse geography, and budgetary constraints."

June 1, 1988

NPS Mathematics Project, 1988-89
Outline of Activities

I. Objectives
  A. Involve NPS teachers in the planning and creation of mathematics training videos that can be used by individual teachers and by groups concerned with mathematics pedagogy.
  B. Provide teachers in live seminars with information about the elementary math curriculum.
  C. Demonstrate the usefulness of video as an inservice teacher training tool that overcomes the barriers of small numbers, diverse geography, and budgetary constraints.

II. Planning (months 1-5)
  A. Expand the Advisory Committee to include NPS teachers and CUNY math faculty.
    - Will develop needs assessment, topics, monitoring plan.
  B. Involve the 26 schools which participated in 1987-88 and their grade 4-6 math teachers.
    - Recruit seven additional new schools to participate in the seminars and the field tryouts.
  C. Develop production plan for six videotape seminars.
    1. Schedule biweekly over several months.
    2. Designate topic and seminar leader for each.
      - Topics may include: math anxiety; learning styles; reinforcing spatial visualization; teaching with manipulatives; calculators; involving parents in mathematics learning; and testing, homework, and introducing new math topics.
    3. Develop formal script for each.

III. Training (months 6-9)
  A. Select participating teachers from grades 4-6.
  B. Develop classroom-like set for studio videotaping.
  C. Tape the seminars with live audiences of teachers.
  D. Commence editing of tapes into six 20-30 minute segments.

IV. Dissemination (months 10-12)
  A. Complete editing of tapes.
  B. Duplicate tapes.

V. Pilot test (months 10-12)
  A. Field try-out of tapes
    1. Led by Peer Leaders.
      - Teachers who participated in videotaping.
    2. Send to other schools and try out in self-tutorial mode.
    3. Develop Field Guide and Assessment.
    4. Conclude assessment.
  B. Write final report.

II. EVALUATION DESIGN

In designing this evaluation, summative and formative evaluation modalities were considered as appropriate programmatic interventions. It was recognized that summative evaluation's major purposes are to rate participants, judge consultant effectiveness, and compare curriculum content. Evaluation must take place at the end of these processes, as well as "in process" while they are still amenable to change and modification. Formative evaluation data, therefore, meet criteria for ongoing "in process" intervention.

Formative evaluation pinpoints areas of concern so that current and future training can be reflective, thereby becoming more relevant, pertinent, and beneficial. The primary purpose of formative evaluation is to determine how well a given task has been taught and to define that part of the task still to be mastered.

Summative evaluation usually serves to document the effectiveness of a project; it usually comes too late to influence practices of the program as they are being evaluated.

A combination of formative and summative statements is included in this Report in order to reflect the effect of ongoing changes, adaptations, and modifications on participants' training needs and to assess project achievement.

This Evaluator gained historical and ongoing perspectives of the program by engaging in activities which included:

- o Perusing documents concerning the project;
- o Attending project sessions, e.g. Advisory Committee and workshops;
- o Consulting with Project Director;
- o Examining Evaluation Questionnaires;
- o Reviewing a videotape, and
- o Conducting follow-up telephone interviews.

All of the above stated activities were undertaken to accomplish evaluation objectives which included:

1. ascertaining the value perceived by participants of the program offerings in terms of the functions they performed;
2. obtaining participant recommendations for changes and modifications, and
3. evaluating change in participants' knowledge and plans as the result of training.

This evaluation report presents data distilled from primary and secondary sources - both formative and summative - from which a statement of program effectiveness can be made. Based on all data examined, this Evaluator deems the project to have been very effective; it responded to existing needs and exemplified significant positive features in design and implementation.

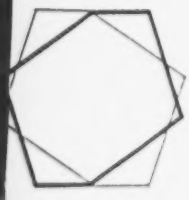
III. METHODOLOGY AND FINDINGS

A. Documents Concerning the Project

Relevant documents related to this year's project were perused by this Evaluator to obtain a view of program conceptualization, a perspective of planned implementation, and a forecast of expected outcomes.

Documents which were read included:

1. Project Proposal;
2. Advisory Committee Memorandum (6/1/88) notifying members of project's funding for 1988-1989;
3. NPS Mathematics Project, 1988-1989 - Outline of Activities;
4. Advisory Committee Memorandum (6/28/88) scheduling the first meeting for September 8 to discuss the selection of schools and teachers, the math topics to be addressed, and the procedures to be used in producing the videotaped segments;
5. Advisory Committee Meeting (9/8/88): Agenda, which included reviews of prior projects' objectives, outcomes and recommendations plus in-depth description and discussion of the current project's objectives and planned implementation;
6. Letter to Principals (11/10/88) describing the project in detail and inviting teacher participation;
7. Follow-up letter to Principals (12/7/88) concerning identification of participants;
8. Memorandum to Participating Teachers (12/12/88) describing the six workshops in detail and including Registration Form (copy on following page);



The Graduate School and University Center
of the City University of New York
(212) 642-2910, (212)221-3519

Center for Advanced Study in Education
Graduate Center: 33 West 42 Street, New York, N.Y. 10036

REGISTRATION FORM

I plan to attend the Mathematics Workshops checked below:

___ Calculus in the Classroom.....January 19 (Thur)
___ Integrating Mathematics
and Science .....February 2 (Thur)
___ Math Anxiety.....February 16 (Thur)
___ Place Value .....March 2 (Thur)
___ Fractions.....March 16 (Thur)
___ Geometry.....April 10 (Mon)

___ Please keep me on the mailing list for additional information.

___ I am also enclosing the names and addresses of other teachers who would be interested in taking part in this program.

Name: _____ Name: _____

School: _____ School: _____

Address: _____ Address: _____

_____ _____

Your name (please print): _____

School name: _____

Address: _____

_____

_____

Phone number(s): (___)_____

MAIL TO: Barbara R. Heller
CASE, City University of New York
25 West 43 Street, Room 620
New York, NY 10036
(212) 642-2910, (212) 221-3519

9. Reminder Flyer (two weeks prior to first workshop) for participants (copy on following page), and

10. Education for Economic Security Act, Title II, Higher Education Grants Program, Interim Report, Fiscal Year 1988-89 (12/31/88).

These and other communications provided ongoing, sequential, and systematic information about the project, particularly to participating teachers and administrators and to members of the Advisory Committee. They are evidence of orderly recruitment and program development utilizing maximum input and counsel from appropriate individuals and groups.

* * * * IMPORTANT * * * *

Although **CALCULATOR** and **CALCULUS** are derived from the same Latin word ("stone" or "pebble used in reckoning"), we made a mistake in our prior communications to you. The

JANUARY 19 MATHEMATICS WORKSHOP
will be on
THE **USE OF CALCULATORS** IN THE ELEMENTARY CLASSROOM
Friend or Foe?

The Workshop will be held at:
The City University Graduate Center (in mid-Manhattan)
33 West 42 Street (between Fifth and Sixth Avenues, opposite the New York Public Library)
In the **Third Floor Studio** room (signs will be posted)

The first Workshop on CALCULATORS is scheduled for:
January 19, 1988 (Thursday)
From **1:00 to 4:00 p.m.**

Light refreshments, in accordance with all dietary requirements, will be served: coffee, tea, fruit, and other desserts. In addition, you may bring your own lunch.

We will also supply teachers with all the materials needed to participate fully in the workshop and handouts, readings, and activities appropriate for use in the classroom.

Call **Barbara R. Heller** at **(212) 642-2910** to reserve your place or complete and return the Reservation Form sent to you previously. Call also if you need travel directions or have other questions.

(Please also note that all subsequent Workshops (**February 2** on **Math and Science**; **February 16** on **Math Anxiety**; **March 2** on **Place Value**; **March 16** on **Fractions**; and **April 10** on **Geometry**) will be held at the same address (33 West 42 Street), same room (Third Floor Studio), and at the same time (1:00-4:00 p.m.). We will provide materials for each session and light refreshments.

B. Advisory Committee Meeting

This Consultant attended the Advisory Committee Meeting held on September 8, 1988 at the CUNY Graduate School. Those who attended comprised a cross-section of the project's technical consultants, teacher representatives, representatives from nonpublic school agencies and organizations, project staff, and other consultants.

Items discussed followed a mailed agenda, copy of which appears on the following page. Brief review of the three prior year projects ensued, specifically related to goals, results, and recommendations.

In-depth description and discussion followed concerning the current project's objectives; selection process for schools and teachers, videotape session topics, and consultants; script preparation, and production schedules. Throughout the meeting, the Project Director encouraged sharing and brainstorming to obtain maximum participation.

The Project Director emphasized that this teacher training approach (planning and creation of mathematics training videos for use by individual teachers and/or groups concerned with mathematics pedagogy) had "state of the art" merit. In addition, this approach might resolve many of the obstacles encountered by prior programs, e.g. budgetary, geographic, teacher release, and travel-related.

The Graduate School and University Center
of the City University of New York

Center for Advanced Study in Education
Graduate Center: 33 West 42 Street, New York, N.Y. 10036

ADVISORY COMMITTEE MEETING
September 8, 1988
CUNY Graduate School, Room 300N

A Distance Learning Approach to Mathematics Instruction in the Nonpublic Elementary Schools

AGENDA

1. Review of prior years' goals and accomplishments:
   - Year 1, 1985-86.
   - Year 2, 1986-87.

2. Overview of 1987-88, year 3:
   - Goals and objectives.
   - Results and recommendations.

3. Current project (1988-89) school year:
   - Objectives.
   - Selecting schools, participants, consultants, and teacher-representatives to the Advisory Committee.
   - Selecting topics; preparing scripts; working with technical consultants.
   - Developing the production schedule and preparing the participants.
   - Scheduling the field try-out.

4. Related projects:
   - The 14th annual Public-Nonpublic School Conference, December 1, 1988.
   - The Public-Nonpublic School Collaborative Program (Milkin Family Foundation).

The group expressed the opinion that videotapes using teachers from the nonpublic schools as workshop participants would foster feelings of "ownership" which would be transmitted to colleagues, administrators, schools, and school systems. Thus, this staff development vehicle appeared to have potential to make a unique contribution, unlike more traditional and commercial efforts using audio-visual approaches.

In the December 1988 Interim Report, several essential agreements and understandings arrived at during this first meeting of the full Committee were described:

> "The main order of business was to select the schools to participate; a total of 36 schools was sought - an increase of 10 from the prior year - proportionately divided among the coordinating agencies and organizations. The group decided that, in addition to giving priority to those schools that participated in 1987-88, schools that had taken part in previous years would also be considered as well as new schools whose administrations were committed to the goals of the project. It was also agreed upon that of this pool of schools, those having at least one or more teachers attend three or more workshops would be defined as participants and would receive a full set of training videotapes. This was communicated to the schools by the advisors and by letter to the principals from the project director." (page 2)

Throughout the meeting, Advisory Committee members were given organized and clear information. They were called upon to give counsel and advice, and to make appropriate judgments based on the information received. They seemed responsive to this sensitive and respectful interpretation of their decision-making function, which varied widely from "rubber stamping" usually reserved for such committees.

C. Mathematics Training Videotapes

Six mathematics training videotape seminars were conducted in the 3rd floor Studio of the CUNY Graduate Center, using the professional and technical assistance of the audio-visual staff. The final topics selected for videotaping resulted from extensive collaborative effort; the selection process represented the combined input of the mathematics consultants, technical advisors, teacher representatives, project staff, and Advisory Committee members. Prior to the final selection of topics, the two teacher representatives conducted a needs assessment with administrators and peers, and surveyed students to determine pertinent problems and issues.

For each of the sessions, audiences of teachers were taped "live" on a classroom-like set. Copy of each Workshop Agenda appears in Appendix A. Each Agenda gives a brief statement concerning credentials of leaders and consultants.

Problem-solving strategies were emphasized throughout the workshop sessions. In addition, as appropriate, manipulative devices were used to motivate, illustrate, and instruct. Resource materials, relevant to the topic under study, were provided with a view to practical classroom application. Sample copies of selected resource materials distributed appear in Appendix B.

D. Analysis of Participating Teacher Rating Forms

Participating teachers were requested to complete a Participating Teacher Rating Form. These forms were identical for all six sessions, providing for composite analysis of user feedback. Copy of the rating form for workshop #2 appears on the following pages.

Fifty-four rating forms were received for all six workshops combined, as follows:

Workshop	N	Topic for Session
1	8	Calculators in the Classroom
2	12	Integrating Mathematics and Science
3	10	Math Anxiety
4	9	Understanding Decimals (Place Value)
5	8	Mastering Fractions
6	7	Geometry
Total	54	

Page 1 of the Participating Teacher Rating Form consisted of two parts:

o I Liked Today's Workshop Because...(Check all that apply.) with 13 items for checkoff and 1 to be filled in. Participants made a total of 562 checks for the six workshops to indicate positive feelings, resulting in an average of 10.41 reactions per person. This is a very high response rate for positive reactions. Two items were tied (51 responses each) as

MATHEMATICS WORKSHOP, NONPUBLIC SCHOOLS
Participating Teacher Rating Form
Center for Advanced Study in Education
The CUNY Graduate School and University Center

Name:_____

School:_____

#2 INTEGRATING MATHEMATICS AND SCIENCE (2/2/89)

Your candid and complete responses will help us to evaluate the value of today's presentation, resource materials, and interaction.

I. I LIKED THE SESSION ON INTEGRATING MATHEMATICS AND SCIENCE BECAUSE.....(Check all that apply.)

__I received some new information
__some ideas I heard before were presented in new ways
__the presenter was knowledgeable
__the material was interesting
__the ideas presented were practical
__it gave me new ideas and/or activities to try in my classroom
__it motivated me to try some new techniques
__the presentation was clear
__the presenter was well prepared
__I had an opportunity to work with colleagues from other schools
__I learned additional teaching strategies
__it made me feel more confident
__it made me feel more professional
__other (be specific, please):_____

_____

_____

II. OVERALL ASSESSMENT

Please circle a number below to indicate your overall assessment of the workshop on INTEGRATING MATH AND SCIENCE:

1	2	3	4	5
Poor	Below Average	Average	Above Average	Outstanding

Briefly specify the reasons or factors underlying your overall assessment.

_____

_____

_____

III. I WOULD HAVE LIKED THE WORKSHOP BETTER IF.. (Please fill in.)

1. More information had been provided about_____
_____

2. (If) it met my needs for_____
_____

3. (If) it met my students' needs for_____
_____

4. Other (Specify other ways in which you would have liked the session more.)
_____

IV. Please briefly describe two specific ideas, suggestions, or techniques you learned as a result of the workshop on INTEGRATING MATH AND SCIENCE.

1. _____

2. _____

V. How confident do you now feel about integrating mathematics and science in some lessons for the children in your class? (Circle one number.)

1	3	4	5
Not confident at all	Not very confident	Somewhat confident	Very confident

Please describe what kind of additional information or support you would need to integrate mathematics and science in your lessons: _____

_____

VI. Once you became accustomed to the cameras and lights, how disruptive did you find the videotaping to be overall?

1	2	3	4
Not disruptive at all	Not very disruptive	Somewhat disruptive	Very disruptive

Do you have any suggestions for videotaping future workshops?

_____

Thank you for completing this evaluation. Please mail it to : B.R. Heller CASE, Room 300N, CUNY Graduate Center, 25 West 43rd Street, New York, New York 10036

top-ranking positives (the ideas presented were practical; the presentations were clear), with "the presenters were well prepared" (50 responses), "the presenters were knowledgeable" (49 responses), and "it gave me new ideas and/or activities to try in my classroom" (49) close behind.

o Overall Assessment

Using the Likert-type scale presented where

1	2	3	4	5
Poor	Below Average	Average	Above Average	Outstanding

were given as categories, participants made the following ratings for the six workshops:

Rating	No.	Weighted Score
Poor	0	0
Below Average	0	0
Average	4	12
Above Average	22	88
Outstanding	28	140
Total	54	240

Weighted Average = 4.44

Table 1, which appears on the following page, presents composite data for the rating form's two parts on page 1.

Page 2 of the rating form consisted of four types of evaluation areas:

- o I Would Have Liked Today's Workshop Better If...
- o Briefly describe two specific ideas, suggestions, or techniques you learned as a result of this workshop.

TABLE 1

COMPOSITE ANALYSIS OF PARTICIPATING TEACHER RATING FORMS
MATHEMATICS WORKSHOPS NONPUBLIC SCHOOLS

I. I LIKED TODAY'S WORKSHOP BECAUSE....(Check all that apply.)

No. of Responses	
42	I received some new information
29	some ideas I heard before were presented in new ways
49	the presenter was knowledgeable
46	the material was interesting
51	the ideas presented were practical
49	it gave me new ideas and/or activities to try in my classroom
45	it motivated me to try some new techniques
51	the presentation was clear
50	the presenter was well-prepared
39	I had an opportunity to work with colleagues from other schools
40	I learned additional teaching strategies
33	it made me feel more confident
28	it made me feel more professional
8	other (be specific, please): "stimulating" to be with other math people; "more confident"; helped my "math anxiety"(2); "loved cartoons, thrilled with finger multiplication"; "great fruit salad"; "more confident about teaching geometry; "math easier to understand and fun"

II. OVERALL ASSESSMENT

Please circle a number below to indicate your overall assessment of the workshop on DECIMALS:

1 Poor	2 Below Average	3 Average	4 Above Average	5 Outstanding
0	0	4	32	28

No. Rating — Weighted Average 4.4

Briefly specify the reasons or factors underlying your overall assessment. workshop time "flew by"; leaders = "enthusiastic,"; material "intriguing"; pace "too brisk"/more time needed; workshops presented in professional/practical way; "useful"; presentations "clear, direct, to the point"; "motivated me to try team teaching with science colleague"; "made science curriculum presentable to class in easy everyday manner with everyday materials"; "gave me new ideas"; "gave me basis for working with the math teacher for certain topics"; "experienced ways to make science/math more enjoyable, to eradicate fears from the minds and attitudes of the children"; "lessons could be applied to most age groups"; "informative"; "good combination of explanation and 'hands on'"; "reinforced new concepts related to math and science skills"; "feel more comfortable about math"; "put at ease - felt like one of the group, not an outsider"; "learned a great deal"; "excellent presentation, materials, and idea"; "presenter an experienced teacher who understands students and their needs"; "excellent idea to introduce decimals with the grid - visual method; "creative"; "concrete suggestions helpful"; illustrated that "students learn more by doing"; "amazing"; "more information needed to address actual equations, multiplication, and division"; "useful exchange of ideas fostered"; balanced with "basics, logic, and puzzles"; "made geometry easier to understand"; "geometry was made to come alive."

- How confident do you now feel about dealing with math anxiety in your classroom? How confident do you now feel about dealing with your own feelings of math anxiety?

- Once you became accumstomed to the cameras and lights, how disruptive did you find the videotaping to be overall? Do you have any suggestions for videotaping future workshops?

Sixteen of 54 respondents (30.0%) made comments concerning ways the workshops might have been improved for them; 70.0% either left the spaces blank or indicated that the workshops were "excellent as is." The comments made, sometimes beyond the focus of the workshop topic, appear below:

Workshop	Responses	Comments
1	3	more information needed about use of calculators; more information needed for grades 6-8; more information needed about teaching multiplication and giving remediation
2	4	should have related to higher grades in science; more accurate scales needed (2); should have related to students' needs for manipulative development
3	3	more time needed; more information needed about "ability to understand abstract ideas" and "teaching 23 children who hate math and would rather 'act out'"; opportunity needed to practice different methods
4	3	"information needed about dealing with slow and quick learners in the same class; "more information about powers of ten"; "more specifics in actually doing operations involving decimals
5	1	more specifics about multiplication and division
6	2	"hands on" method; "more concepts for student use"

When respondents described two specific ideas, suggestions, or techniques learned as a result of each workshop (item IV., page 2 of rating form), their answers were highly individualized and consistent with the topic being studied. For example, workshop participants mentioned "using calculators to teach place value" and "conversion of years into hours" (workshop 1); "using manipulatives to introduce fractions" (workshop 5), and "using the different shapes to help students enjoy learning geometry" (workshop 6). Responses varied widely; comments ran the gamut from specifics to change teacher performance, curriculum content, and student attitudes. It was apparent that most participants had translated the workshop experiences into practical classroom applications, which could be implemented in their schools.

Item V. of the rating form was a "level of confidence" measure which varied according to the workshop topic. On page 21, the "confidence" questions were taken from the Math Anxiety workshop, and will be analyzed further here.

When respondents were asked to circle one number to indicate the "level of confidence" felt about dealing with math anxiety in the classroom (post-workshop reaction), they indicated the following:

	No.	Weighted Score	
1 = not confident at all	0	0	
2 = not very confident	0	0	
3 = somewhat confident	4	12	
4 = very confident	6	24	
Total	10	36	Weighted Average = 3.6

As part of this same question, respondents were asked to circle one number to indicate their post-workshop "level of confidence" about dealing with their own feelings of math anxiety. Responses revealed the following:

	No.	Weighted Score
1 = not confident at all	0	0
2 = no change from before	1	2
3 = somewhat more confident	2	6
4 = much more confident	7	28
Total	10	36 Weighted Average = 3.6

When respondents answered item VI. (reaction to presence of cameras and lights), reactions were overwhelmingly in terms of adjustment and "becoming accustomed" so that feelings of disruption were nonexistent or minor for all workshops.

Comment

Findings from the Participating Teacher Rating Form revealed that respondents were highly positive - often laudatory - about the value of the videotaping sessions. Based on all data received through these rating forms, it is apparent that workshop participants were well satisfied with leader quality, content, and process of all six presentations.

E. Follow-up Telephone Interviews

A sample of five participating teachers who attended one or more videotaping sessions was selected randomly for follow-up through telephone interviews. In prior years, teacher participants were extremely difficult to contact during their school day. They were usually available only at lunch, preparation, or administrative assignment periods, and, usually, seemed harried and pressed for time. In fact, because teachers were so hard to reach, principals of participating schools were used for follow-up population in the 1988 Report to resolve communication problems.

This year attempts were made to refine the follow-up process, since teachers are the primary "consumers" of project services, and this year's project provided a unique learning experience. Refinements of the follow-up procedure included calling back arrangements to the Evaluator's home, setting up after-school interview time, and responding to a teacher's need for weekend discussion. Efforts to improve the process "paid off," with all five teachers responding to the follow-up questions at their leisure.

The following questions were asked of each respondent:

- What were your reactions to the videotaped workshops in which you participated?
- How do you think the edited videotaped films should be used and with whom for the 1989-1990 school year?
- Which of the videotaped topics seemed the most important to you? Why?

Respondents interviewed are identified herein as follows:

Interviewee	Sessions Attended
A	Attended all six workshops.
B	Attended 4 sessions (not Decimals or Geometry)
C	Attended sessions 1, 2, and 3.
D	Attended sessions 1 and 2.
E	Attended 2 workshops (Math Anxiety and Geometry.

The results of the interviews appear below:

Question #1

A - "At first it was mind boggling - the professionalism of the Studio. Later, I forgot about the tv cameras..." The experience was "wonderful, well planned, very professional." All presenters were "excellent, interesting and practical." What was offered was relevant to the classroom.

B - "It was great because I relaxed, learned new concepts, received new ideas, particularly how to be more effective in class."

C - "...a tremendous adrenalin boost." "I enjoyed networking with other teachers... I obtained new perspectives." "I enjoyed sharing and reinforcing ideas. Although I was somewhat apprehensive about the video cameras initially, I soon forgot them." "...presentations and presenters were excellent..they sustained interest."

D - "Instructors were knowledgeable, clear and informative; they related to students' experience and my own problems. I'm more confident in class."

E - "I can only say 'very good' about the presenters and the presentations, in all a very positive experience."

Question #2

A - The completed tapes should be used for staff training. "It might be important for older students to see their teachers still learning and attempting to be more creative. I'll recommend using tapes for faculty conferences."

B - "First, it should be used with faculty. Also, it could be used in the classroom with students. Students could profit from Fractions and the activities used."

C - "There's no math department in my school, so it's not as useful as with a large department. There were many fresh ideas, however, that are worthwhile for all subjects. The presentation on math anxiety would be a useful staff development tool."

D - "...best for staff development and training of teachers, to give background for training, and to reduce anxiety." "In my school, three teachers will push what I learned, and the reporting back will be made easier by the tv."

E - "...show the tapes to teachers and to students. Math anxiety is a real thing for students in the upper grades. The tapes might motivate students to do better."

Question #3

A - "I liked Math Anxiety best. I was never a top math student, so that topic should be first because it gave me something for myself."

B - "I saw four. It is hard for me to evaluate since I was in each. All were informative."

C - "I had a problem attending all the workshops. I'm the only math teacher, so when I leave the building there's no math training." "I loved the three I attended. All three were interesting and appropriate."

D - "I wanted to attend all the workshops. I could only get to two, because we have problems getting substitutes. I liked investigating math and science better, although both were good."

E - "Math Anxiety was excellent. I liked it better than Geometry because the teamwork wasn't clear, not a team of equals. Instead of three leaders, the two good presenters should have worked alone; the third was an appendage."

Comment - Interviewees made comments which did not pertain to the three questions. Most of the time they commended the workshops for excellent organization, professionalism and creativity. All five teachers requested more workshops at the Graduate Center, although several mentioned problems with distance, travel, and substitutes as deterrents to attendance.

IV. DISSEMINATION AND PILOT EFFORTS

Each workshop session produced a lengthy videotape in need of painstaking refinement and careful editing in order to obtain a product suitable for dissemination to participating schools.

While this technical/production process was still in its infancy, another CASE project was planning to conduct a series of staff development and training workshops for elementary and middle school guidance counselors from a New York City public school district. Since the agenda for the first workshop included a segment on Math Anxiety, with the Project Director of this NPS Math Program as presenter, it was decided that an audio-visual component might provide an innovative learning experience.

In order to combine an audio-visual component with the more traditional didactic/experiential approaches, the Math Anxiety tape was edited to produce a 15-minute segment for pilot testing with 25 guidance counselors.

The videotape was well received by the audience; it provided appropriate and relevant orientation to and motivation for the presentation on Math Anxiety.

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This Evaluation Report proposed to describe the process and procedures used to implement this project and to assess the effectiveness with which goals and objectives were achieved during the 1988-1989 period of operation.

In order to accomplish these evaluation purposes, data were generated and compiled to assess the quality of the program in terms of overall functioning. In addition, specific programmatic aspects of the program were perused, observed and measured to determine their value to participants and to program implementation, e.g. perusal of project documents; attendance at Advisory Committee meeting; presence at videotaping sessions; follow-up telephone interviews.

Based on analysis and interpretation of data, both formative and summative, from primary and secondary sources, it can be concluded that this project was exemplary primarily because it responded to perceived needs and manifested significant positive characteristics.

Examples of specific positive features of this year's project design, implementation, and operationalization are set forth in the summary and concluding statements below:

- This project incorporated an innovative teacher training model by which nonpublic school children could gain greater access to quality instructional opportunities.
- The delivery strategy chosen - videotape demonstrations - focused on methods to overcome barriers "inherent in the small size and geographic spread of nonpublic schools generally."

- o The project increased the size of its Advisory Committee, broadened its scope, and made maximum use of its input, advice, and counsel.

- o Participating teachers were given unique workshop experiences where they both learned and "performed" live in videotape creation, thereby gaining "ownership" of this teacher training device.

- o The Project Director provided able leadership which resulted in a well planned and organized operation.

- o Consultants and workshop leaders were knowledgeable and expert in the field of mathematics. In addition, they were sensitive and empathic group communicators.

- o The project continued to foster relationships established in prior years of project operation with school personnel in religiously-oriented schools.

- o Feedback received from participating teachers' workshop rating forms and from follow-up telephone interviews consistently described the project's offering in highly positive terms.

- o Recruitment of teacher participants was managed in a systematic and orderly fashion, with communications about the project being provided to principals and Advisory Committe members on an ongoing basis.

- o Workshop participants received appropriate, relevant, and practical resource materials.

- o Participants engaged in cognitive and affective experiences. Workshop sessions included didactic and experiential aspects, with emphasis on "hands on" techniques.

- o Problem-solving strategies were stressed at all workshop sessions. When appropriate, manipulative devices were used to motivate, illustrate, and instruct participants. Leaders modeled effective teaching in a classroom where learning math could be fun.

These summary and concluding statements are evidence of positive characteristics attributable to this year's project implementation.

Recommendations made are culled from all evaluative data related to the project, as well as from personal observation, analysis, and interpretation. Based on an overview of the project, the following recommendations are made:

1. The project's goal of improving the quality of mathematics instruction in nonpublic, religiously-oriented schools is an appropriate one, which should be pursued during the 1989-1990 school year.

2. Suggestions offered by respondents during this year of project operation should be reviewed carefully and adopted if feasible, in order to make future program offerings even more effective. Particular attention should be given to those suggestions which request longer sessions and continued differentiation by grade level.

3. The content, materials, process, and procedures used for this project should be codified to faciliate replication.

4. Dissemination and pilot testing of the edited videotape series should be made available for teacher training in September 1989. In addition, usage with a wider audience (e.g. students in upper elementary grades) should be considered.

5. The Math Anxiety workshop reached teachers on two levels - as professionals interested in improving their teaching skills, and as individuals who are "math anxious." Consideration should be given to expanding the Math Anxiety topic, particularly with regard to emotional/psychological factors which interfere with students' ability to learn mathematics.

APPENDIX A

WORKSHOP AGENDAS

Center for Advanced Study in Education
The Graduate School and University Center
The City University of New York

Quality Mathematics Instruction in Nonpublic Elementary Schools in New York City
1988 - 89

CALCULATORS IN THE CLASSROOM
Workshop # 1
January 19, 1989

Barbara R. Heller, Project Director

Milly Rosner, Workshop Leader
Currently a master teacher at SAR Academy, a Jewish Day School in the Bronx, Mrs. Rosner teaches 5th grade and supervises the Learning Resource Room. Milly has conducted Citywide inservice workshops for the Metropolitan NY-NJ Association of Jewish Day Schools, written an article about mathematics, and now also works on a grant to teach mathematics to gifted 1st and 2nd graders.

Consultants: Sandra Clarkson, Professor of Mathematics and Director of the Mathematics Learning Center, Hunter College, CUNY.

Joseph M. Greco, Mathematics and Science Coordinator, St. Anthony School, NYC.

Susan Turkel, Professor of Mathematics Education, Queens College, CUNY.

This program is funded by the New York State Department under EESA Title II(132-89-0039).

Center for Advanced Study in Education
The Graduate School and University Center
The City University of New York

Quality Mathematics Instruction in Nonpublic Elementary Schools in New York City
1988 - 89

INTEGRATING MATHEMATICS AND SCIENCE
Workshop # 2
February 2, 1989

Barbara R. Heller, Project Director

Joseph M. Greco, Workshop Leader
Joe is now the Mathematics and Science Coordinator, St. Anthony School, NYC; and a New York State Science Mentor. He also coordinates the NYS Regents Action Plan for both math and science for the New York Archdiocese and serves on the Manhattan Advisory Council for Upper Grades for the Archdiocesean Instructional Television. Joe is an experienced workshop leader, having given many workshops for teachers and parents and he is often invited into the classroom to work directly with students.

Consultants: **Sandra Clarkson**, Professor of Mathematics and Director of the Mathematics Learning Center, Hunter College, CUNY.

Milly Rosner, 5th grade teacher and supervisor of the Learning Resource Room at SAR Academy, in the Bronx.

Susan Turkel, Professor of Mathematics Education, Queens College, CUNY.

This program is funded by the New York State Department under EESA Title II(132-89-0039).

Center for Advanced Study in Education
The Graduate School and University Center
The City University of New York

Quality Mathematics Instruction in Nonpublic Elementary Schools in New York City 1988 - 89

MATH ANXIETY
Workshop # 3
February 16, 1989

Barbara R. Heller, Project Director

Barbara R. Heller and Milly Rosner, Workshop Leader(s)

Ms. Heller is a Senior Project Director at the Center for Advanced Study in Education and Director of Special Programs at the City University Graduate Center. Barbara has had extensive experience in designing and conducting credit and in-service staff development projects in mathematics for teachers; and has worked with elementary, secondary, and postsecondary level teachers. She has also developed special curricula and other teaching materials; written numerous articles for professional publications; and is author of The Only Math Book You'll Ever Need, an adult guide to the mathematics of everyday life.

Mrs. Rosner is currently a master teacher at SAR Academy, a Jewish Day School in the Bronx, where she teaches 5th grade and supervises the Learning Resource Room. Milly has conducted Citywide inservice workshops for the Metropolitan NY-NJ Association of Jewish Day Schools, written an article about mathematics, and now also works on a grant to teach mathematics to gifted 1st and 2nd graders.

Consultants: **Sandra Clarkson**, Professor of Mathematics and Director of the Mathematics Learning Center, Hunter College, CUNY.

Joseph M. Greco, Mathematics and Science Coordinator, St. Anthony School, NYC.

Susan Turkel, Professor of Mathematics Education, Queens College, CUNY.

This program is funded by the New York State Department under EESA Title II(132-89-0039).

Center for Advanced Study in Education
The Graduate School and University Center
The City University of New York

Quality Mathematics Instruction in Nonpublic Elementary Schools in New York City
1988 - 89

UNDERSTANDING DECIMALS (PLACE VALUE)

Workshop # 4
March 2, 1989

Barbara R. Heller, Project Director

Joseph M. Greco, Workshop Leader

Joe is now the Mathematics and Science Coordinator, St. Anthony School, NYC; and a New York State Science Mentor. He also coordinates the NYS Regents Action Plan for both math and science for the New York Archdiocese and serves on the Manhattan Advisory Council for Upper Grades for the Archdiocesean Instructional Television. Joe is an experienced workshop leader, having given many workshops for teachers and parents and he is often invited into the classroom to work directly with students.

Consultants: **Sandra Clarkson**, Professor of Mathematics and Director of the Mathematics Learning Center, Hunter College, CUNY.

Milly Rosner, 5th grade teacher and supervisor of the Learning Resource Room at SAR Academy, in the Bronx.

Susan Turkel, Professor of Mathematics Education, Queens College, CUNY.

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MASTERING FRACTIONS

Workshop # 5
March 16, 1989

Barbara R. Heller, Project Director

Milly Rosner, Workshop Leader

Currently a master teacher at SAR Academy, a Jewish Day School in the Bronx, Mrs. Rosner teaches 5th grade and supervises the Learning Resource Room. Milly has conducted Citywide inservice workshops for the Metropolitan NY-NJ Association of Jewish Day Schools, written an article about mathematics, and now also works on a grant to teach mathematics to gifted 1st and 2nd graders.

Consultants: **Sandra Clarkson**, Professor of Mathematics and Director of the Mathematics Learning Center, Hunter College, CUNY.

Joseph M. Greco, Mathematics and Science Coordinator, St. Anthony School, NYC.

Susan Turkel, Professor of Mathematics Education, Queens College, CUNY.

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1988 - 89

GEOMETRY
Workshop # 6
April 10, 1989

Barbara R. Heller, Project Director

Milly Rosner and Joseph M. Greco, Workshop Leader(s)

Mrs. Rosner is currently a master teacher at SAR Academy, a Jewish Day School in the Bronx, where she teaches 5th grade and supervises the Learning Resource Room. Milly has conducted Citywide inservice workshops for the Metropolitan NY-NJ Association of Jewish Day Schools, written an article about mathematics, and now also works on a grant to teach mathematics to gifted 1st and 2nd graders.

Joe is now the Mathematics and Science Coordinator, St. Anthony School, NYC; and a New York State Science Mentor. He also coordinates the NYS Regents Action Plan for both math and science for the New York Archdiocese and serves on the Manhattan Advisory Council for Upper Grades for the Archdiocesean Instructional Television. Joe is an experienced workshop leader, having given many workshops to teachers and parents.

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Susan Turkel, Professor of Mathematics Education, Queens College, CUNY.

This program is funded by the New York State Department under EESA Title II(132-89-0039)

APPENDIX B

SAMPLE WORKSHOP MATERIALS

Calculators in the Mathematics Classroom

The following statement is an official NCTM position. It was developed jointly by the Technology Advisory Committee, the Instructional Issues Advisory Committee, and the Committee to Implement the Recommendations of An Agenda for Action *and adopted by the Board of Directors.*

THE National Council of Teachers of Mathematics recommends the integration of the calculator into the school mathematics program at all grade levels in classwork, homework, and evaluation. Although extensively used in society, calculators are used far less in schools, where they could free large amounts of the time that students currently spend practicing computation. The time gained should be spent helping students to understand mathematics, to develop reasoning and problem-solving strategies, and, in general, to use and apply mathematics.

At each grade level every student should be taught how and when to use the calculator. To use calculators effectively, students must be able to estimate and to judge the reasonableness of results. Consequently, an understanding of operations and a knowledge of basic facts are as important as ever. The evaluation of student understanding of mathematical concepts and their application, including standardized tests, should be designed to allow the use of the calculator.

The National Council of Teachers of Mathematics recommends that all students use calculators to—

- concentrate on the problem-solving process rather than on the calculations associated with problems;
- gain access to mathematics beyond the students' level of computational skills;
- explore, develop, and reinforce concepts including estimation, computation, approximation, and properties;
- experiment with mathematical ideas and discover patterns;
- perform those tedious computations that arise when working with real data in problem-solving situations.

The National Council of Teachers of Mathematics recommends that publishers, authors, and test writers integrate the use of the calculator into their mathematics materials at all grade levels.

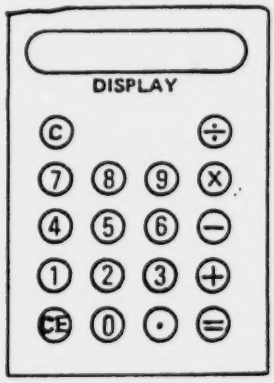
(April 1986)

Data supporting this position statement can be found in the article "Effects of Hand-Held Calculators in Precollege Mathematics Education: A Meta-Analysis," by Ray Hambree and Donald J. Dessart (*Journal for Research in Mathematics Education*, March 1986).

calculators for beginners student workbook

This workbook will help you learn how to use and enjoy simple electronic calculators. As you read, do the examples on your calculator. There will be many exercises. Take pen or pencil in hand and do the exercises, then try out your solutions on your calculator. Oh... you don't have a calculator? In that case (1) read extra carefully, (2) do the exercises and (3) compare your solutions with ours in the *Answerbook* section of this workbook. Many problems have more than one solution and many questions have more than one correct answer. If your answer differs from ours, it may still be correct. Your way of doing it may be different from ours...perhaps even better.

VERY IMPORTANT NOTICE! This workbook works with *our* calculator. However, not all calculators work in exactly the same way as ours. Please keep in mind that the calculator you are using may do things differently.



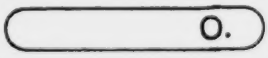
Our calculator has:

An ON-OFF Switch

A DISPLAY

18 keys (we will add more later)

Turn our calculator on. The DISPLAY will look like this:



The DISPLAY displays numbers that we enter by pressing keys. It also displays results of computations.

We will begin each new problem by pressing the (C) key. This *clears* the machine and gets it ready for a new problem. Pressing (C) puts zero (0) into the DISPLAY.

If we make a mistake in entering a number, we press (CE) which means *clear entry.* This erases the incorrect number, but leaves the rest of the problem inside the calculator. After erasing our mistake, we enter the correct number and finish working the problem.

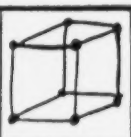
But...pressing (CE) will *not* help us if we press the wrong *operation* key. For example, if we press (×) when we meant to press (÷), we can't correct the mistake by pressing (CE).

Name _____

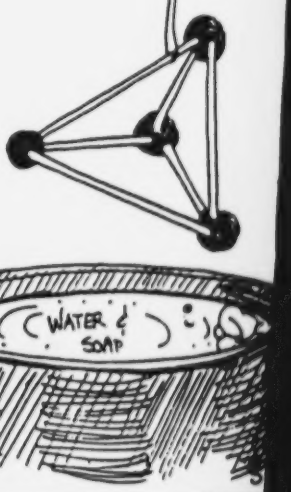
GEO-PANES

What Kind of a Geo-pane can be made with a 3-D shape?

1. Build these shapes with toothpicks and 1cm clay balls. Fill in the chart below:

Shapes						
# of Points/Vertices (clay balls)						
# of Line Segments/ Edges (toothpicks)						
# of Faces (sides)						

2. Hang each shape from a thread and dip completely into a water and soap mixture. Lift it out and observe.



* What do you think will happen? _____

* Describe what happened: _____

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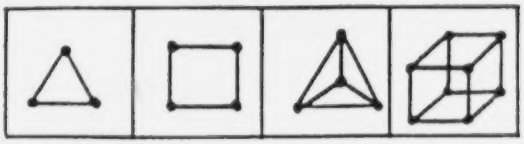
GEO-PANES



I. **Topic Area**
Geometry/Surface Tension

Introductory Statement
Students will discover unique "bubble" patterns formed inside polyhedrons (poly - many hedron - sides, polyhedron - many sided figure)

III. **Math Skills**
Geometric shapes & Vocabulary
Counting

Science Processes
Predicting
Observing
Recording Data
Generalizing

IV. **Materials**
clay
toothpicks
large containers such as ½ gallon milk cartons (1 per group)
liquid dish soap
thread
liter and 15 ml measures, optional
newspaper, optional
scratch paper, optional

V. **Key Question**
What kind of geo pane can be made with a 3-D shape?

VI. **Background Information**
Geo panes are defined as the pattern of "panes" created by dipping shapes into a water and soap solution.

Patterns which would be expected to form around the sides meet instead near the center, sometimes forming another geometric pattern. This illustrates the principles of surface tension. The elastic, rubbery skin formed by the attraction of molecules to one another is pulling itself into the smallest area possible. Less area is used when the soap film comes toward the center than by covering the faces around a geometric shape.

A second discovery can be made regarding the relationship of vertices, edges, and faces for 3-D figures. Euler's (pronounced "oilers") Theorem states that

vertices + faces = edges + 2

This is true for all convex polyhedrons.

VII. **Management**
1. This activity may take from 60 to 90 minutes.
2. Shapes will be made individually but groups of three to four can share one container.
3. Caution students to dip carefully so the mixture's surface stays as bubble-free as possible.
4. Students should use smaller sections of toothpicks to make more complex designs; they may need help drawing additional shapes.

VIII. **Procedure**
1. Spread newspaper to cover tables (or floor) to be used for dipping, preferably away from desks OR plan to do the dipping outside if it's not windy.
2. Use scratch paper to protect desks while rolling clay. Pass out clay, toothpicks, and about 50 cm of thread per person.
3. The teacher or a student can measure about one liter of water and 15 ml or more of liquid soap into each container. Fifteen ml of granulated sugar or glycerin (obtainable at drugstores) may be added to strengthen the mixture. Stir gently without forming bubbles on the surface.
4. The teacher will dip the flat triangle and square in front of the class. For the purposes of this investigation, the resulting "pane" will be called a geo-pane. Discuss results before writing predictions for the 3-D shapes.
5. Discuss the difference between 2-dimensional and 3-dimensional shapes.

IX. **What the Students Will Do**
1. Students will build the shapes shown on the worksheet using toothpicks and clay balls.
2. Students will fill in the chart.
3. Students will observe the teacher dipping the 2-dimensional shapes in the mixture.
4. Students will predict what will happen when 3-D shapes are dipped.
5. Students will hang shapes from an untied thread and dip into the water-soap mixture.
6. Students will dip each shape in several times and record observations.
7. Students may build additional shapes and observe the results.

X. **Discussion**
1. Is the geo-pane pattern the same each time? (usually, but a change in conditions - soap bubbles, wind, etc. - can cause differences)
2. How could you change the geo-pane pattern? (changing the position of the thread, popping one pane, blowing on it, etc.)

XI. **Extensions**
1. Find a pattern relationship between vertices, edges, and faces. See Background Information.
2. Time how long the bubbles last. How could you make them last longer?

XII. **Curriculum Coordinates**
Art
1. Build 3-D geometric figures out of paper. This is also a good preliminary activity.
2. Make stained glass windows.

Computer
1. Create 3-D geometric figures using LOGO.

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Center for Advanced Study in Education
The City University Graduate Center
MATH ANXIETY WORKSHOP
February 16, 1989

You will have 15 minutes to complete the following problems. Please do all the calculations OR explain in writing the steps needed to solve the problems.

Also, please make note of your feelings as you do the work.

Problem #1

A car goes 20,000 miles on a trip. To save wear, the 5 tires are rotated regularly. How many miles will each tire have gone by the end of the trip?

Problem #2*

The Mach number is the ratio of the speed of an object to the speed of sound in the medium through which the object is traveling. Sound travels through air (at 32°F or 0°C) at about 742 miles per hour. The Concorde is called a supersonic transport (SST) because it travels faster than the speed of sound. If the SST travels at approximately 1,300 mph, what is its Mach speed?

Problem #3*

In NYC, the sales tax is 8¼%. If a new car is $7,870, how much will the car cost and how much of this will we be paying in tax?

PEANUTS **By Charles Schulz**

YOU KNOW WHAT I THINK YOU HAVE, SIR? YOU HAVE "MATH ANXIETY"
IF I ASKED YOU HOW MANY WAYS THAT NINE BOOKS COULD BE ARRANGED ON A SHELF, WHAT WOULD BE YOUR FIRST REACTION?
AAUGHH!
2-21
SEE? YOU HAVE "MATH ANXIETY"
Schulz

c United Features Syndicate Inc.,

MATH ANXIETY DEFINED

Math anxiety describes a range of negative feelings and beliefs about mathematics that causes its victims to suffer from mild to severe discomfort (including physical symptoms); interferes with their ability to concentrate, pay attention, and assimilate mathematical information; and impedes their capacity to deal with mathematical concepts and manipulations in school, in their choice of career and at work, and in everyday situations.

Heller and Kogelman, Creative Classrooms, 1982.

Hundredths

Mathematics teaching objectives:

. Indicate hundredths using a grid model.

. Use word names and numeral names for decimals.

. Compare and order decimal in hundredths.

Problem-solving skills pupils might use:

. Make and/or use a drawing.

. Be aware of other solutions.

Materials needed:

. None

Comments and suggestions:

. A grid is used as a model for writing hundredths in both the word form and the numeral form.

. Pupils can work the two pages individually, or perhaps a transparency of the first page could be used. Both can be finished in about 15 minutes.

. Pupils may need review on the meaning of $<$ and $>$.

. Pupils may need help writing the word names, including the proper spelling and the use of the hyphen.

. Emphasize problems e and f which name 1 as 1.00 and 0 as .00 .

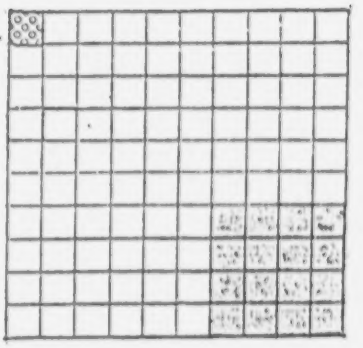
Answers:

1. a.) Twenty-four hundredths
   b.) Seventy-six hundredths
   c.) .24 and .76

2. a.) Thirty-seven hundredths, .37
   b.) Fifty-eight hundredths, .58
   c.) Fifteen hundredths, .15
   d.) Seventy-two hundredths, .72

3. a.) Thirty-three hundredths
   b.) .51
   c.) .93, .94, ..., 1.00
   d.) .00, .10, ..., .09
   e.) One-hundred hundredths or 1.00
   f.) Zero hundredths or .00

HUNDREDTHS



- The large square is one whole unit.
- The marks were used to divide the square into 100 equal parts.
- Each part is called one-hundredth.
- As a decimal this is written .01.
- The shaded part ▣ shows sixteen-hundredths.
- As a decimal this is written .16

1. a. How many hundredths are shaded?

_____ -hundredths

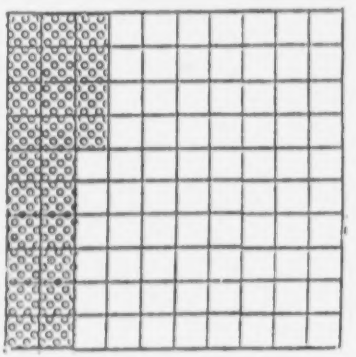
b. How many hundredths are not shaded?

_____ -hundredths

c. Write both of these as decimals.

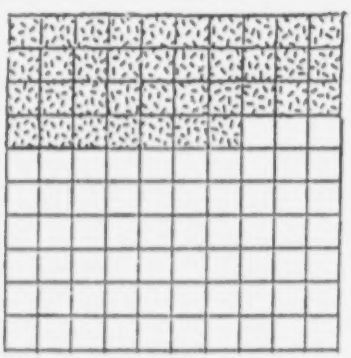
_____ _____

1.



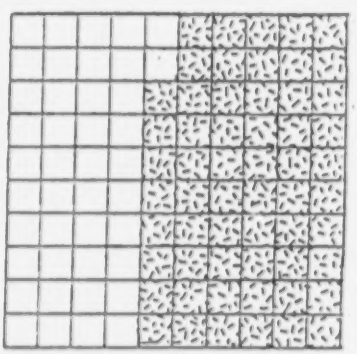
2. What part of each large square is shaded? Write the answer in words and as a decimal.

a.



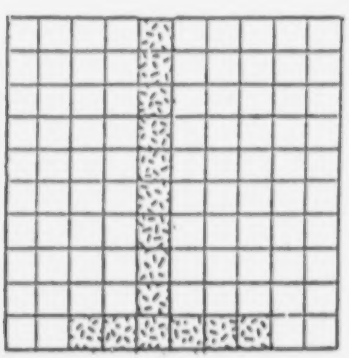
_____

b.



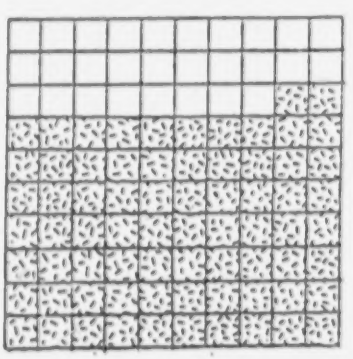
_____

c.



_____

d.

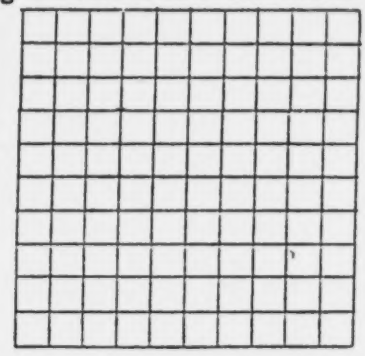


_____

. Hundredths (cont.)

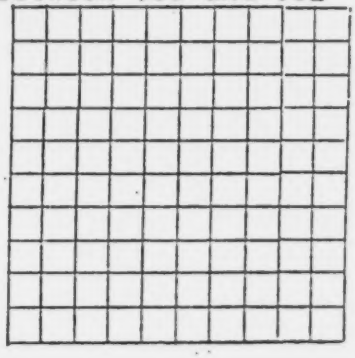
3. Shade each of these squares as indicated. Fill in the blanks.

a. The decimal (one-hundredth) greater than 32-hundredths



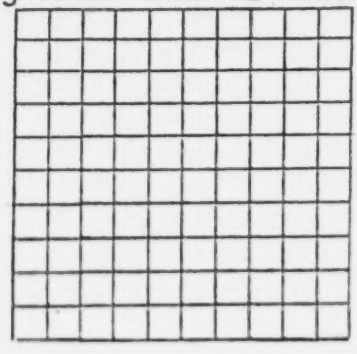
_____-hundredths comes after thirty-two hundredths

b. The decimal (in hundredths) between .50 and .52



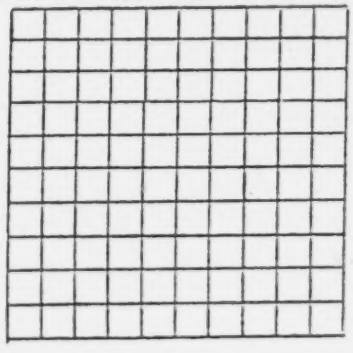
.50, ____,.52

c. Any decimal in hundredths greater than 92-hundredths



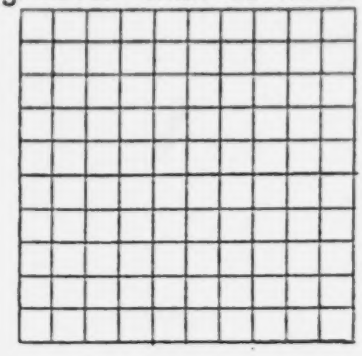
_____ > 92-hundredths

d. Any decimal (in hundredths) less than ten-hundredths

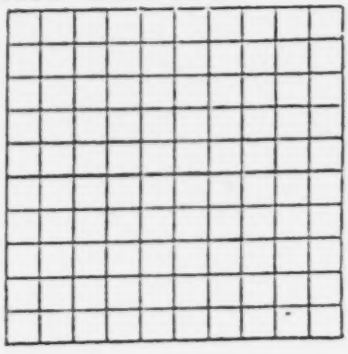


_____ < ten-hundredths

e. The decimal (in hundredths) greater than 99-hundredths



f. The decimal (in hundredths) less than .01



one = ____-hundredths = 1.00 zero = _____ = ____

COVERING THE SQUARE

Mathematics teaching objectives:

Use a grid model to indicate tenths and hundredths.

Determine the simplest way to represent decimals.

Problem solving skills pupils might use:

Make or use a physical model.

Be aware of other solutions.

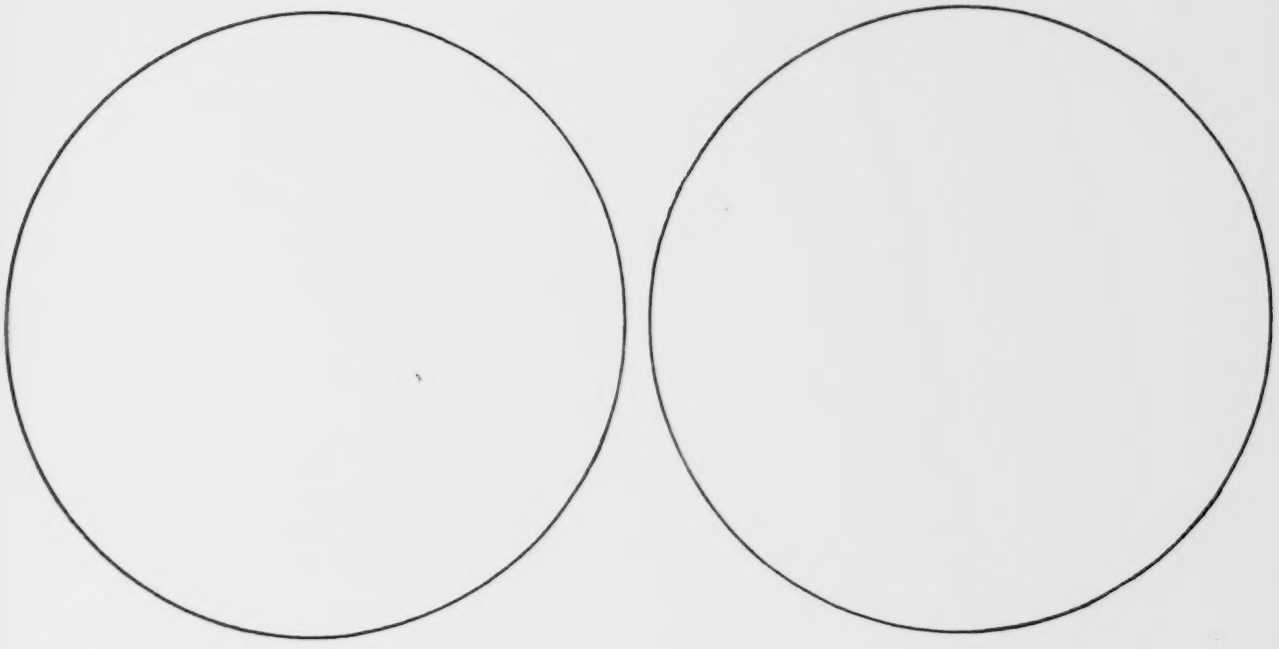
Materials needed:

strips and squares.

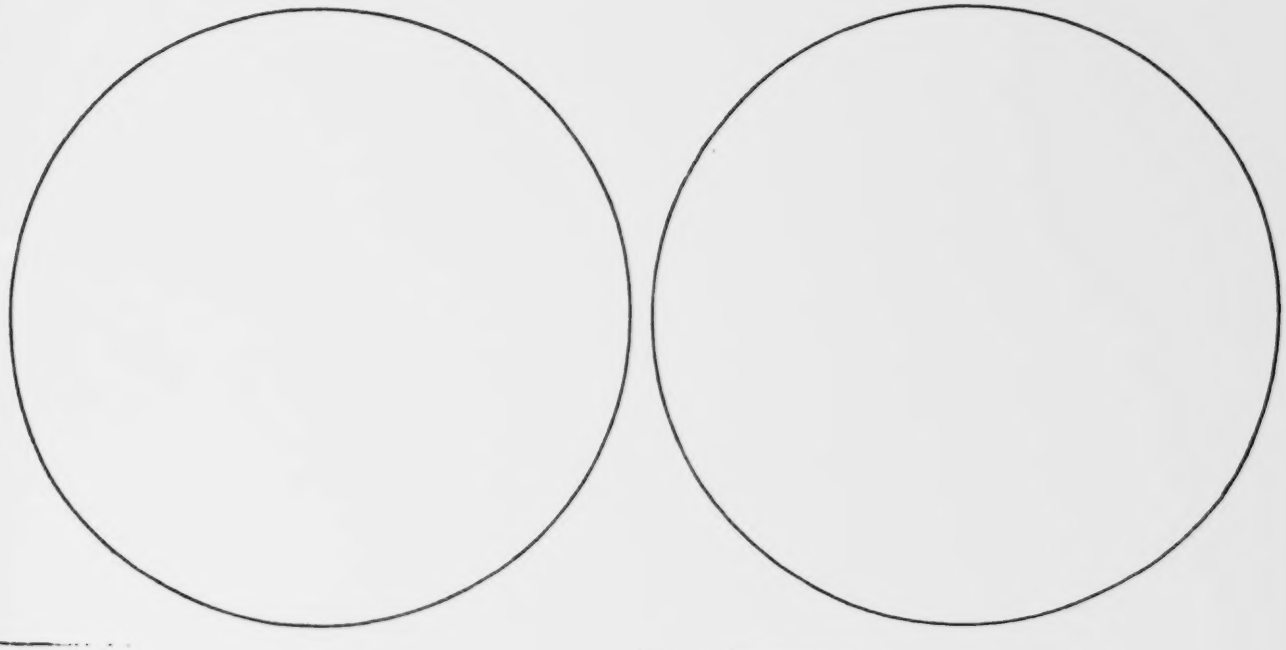
Comments and suggestions:

Several problems emphasize that .1, .2, etc., are equivalent to .10, .20, etc.

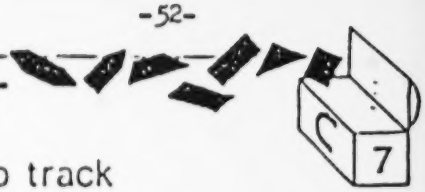
FRACTION PATTERNS



Wholes - White



GEOMETRIC SHAPES CHART



Make geometric shapes with your pieces and keep track by marking this chart.

SHAPE	NUMBER OF PIECES USED						
	1	2	3	4	5	6	7
SQUARE							
TRIANGLE							
RECTANGLE							
PARALLELOGRAM							
TRAPEZOID							
PENTAGON							
HEXAGON							
OTHER							

CHALLENGE: Some of the shapes above cannot be made with all the indicated number of pieces. Give an example, and explain why it's not possible.

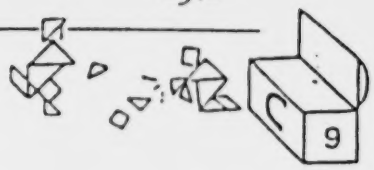
TANGRAMS

A:

1. Make a square using both E triangles.
2. Make a triangle using both E triangles.
3. Make a square using both A triangles.
4. Which two shapes make the B triangle?
5. Which two shapes make the C parallelogram?
6. Can you make a parallelogram with both E pieces?
7. In how many ways can you make an E triangle using 3 smaller pieces?
8. Make a triangle from the 5 smaller pieces.
9. Make a square with the 5 smaller pieces that is equal in area to a square made with both E triangles.
10. Now by adding both E triangles to the square make a rectangle.
11. Move one of the larger pieces so that the rectangle becomes a triangle.
12. Again, move 1 large piece to make a parallelogram.

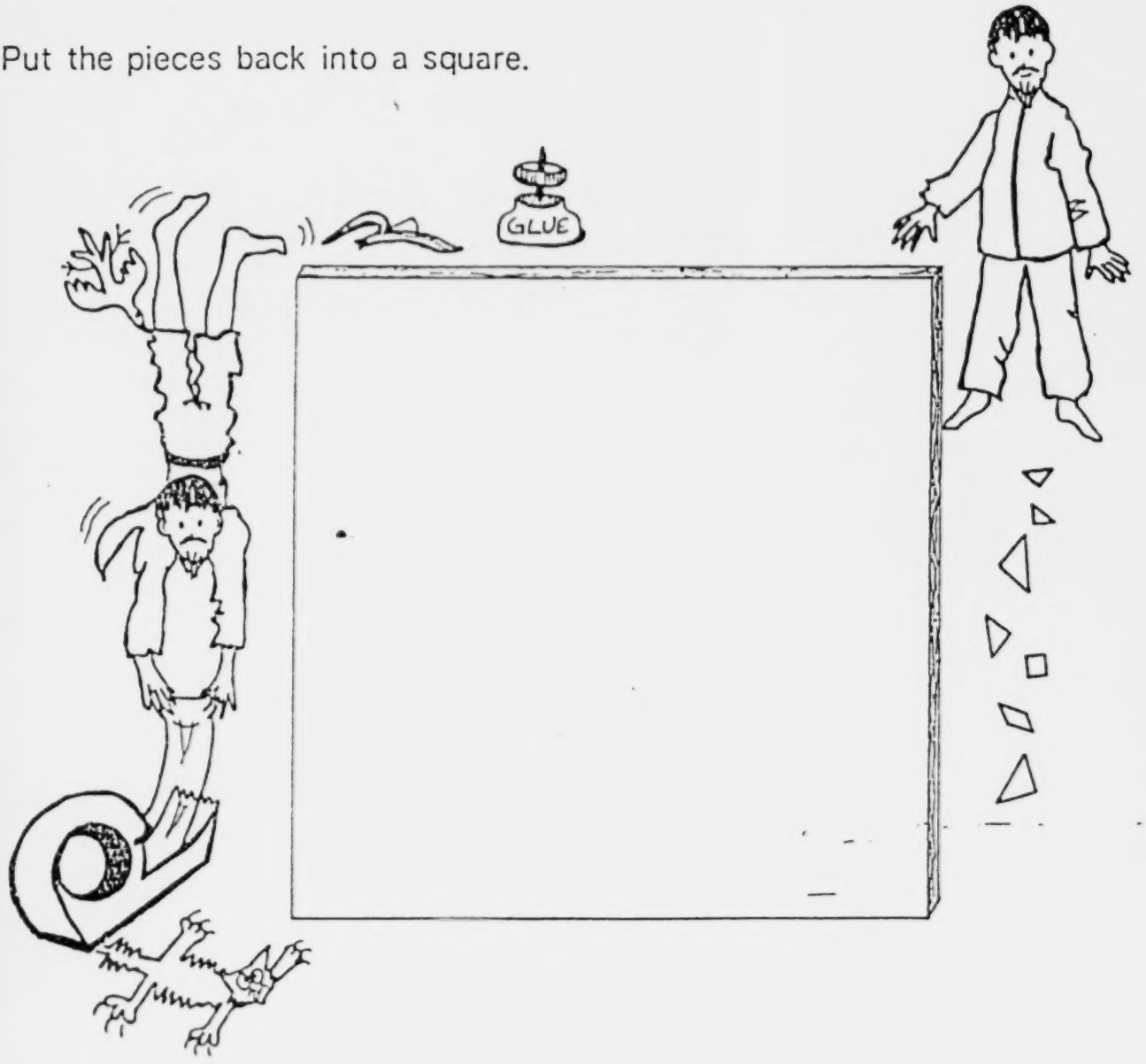
NAME _____

THE CHINESE 'SQUARE' LEGEND



According to legend, the tangram puzzle was discovered by Tan, a Chinese scholar, whose prize treasure was a square ceramic tile. One fateful day, Tan accidentally dropped the tile and it broke into the seven geometric pieces.

Put the pieces back into a square.



CHALLENGE: Use all seven pieces to make another geometric shape. Name it and record your answer by tracing.

TANGRAM TREASURY, BOOK C, BY JAN FAIR, 1987 © CUISENAIRE COMPANY OF AMERICA, INC.

APPENDIX B

Advisory Committee Meeting Agenda
Letter (of Invitation) to School Principals

The Graduate School and University Center
of the City University of New York

Center for Advanced Study in Education
Graduate Center, 33 West 42 Street, New York, N.Y. 10036
(212) 575-1493

June 28, 1988

Memorandum

To: Advisory Committee, Nonpublic School Math Project

From: Barbara R. Heller, Project Director

Re: Advisory Committee Meeting, September 8, 1988

For most people, Thursday, September 8, 1988 was the preferred date for the first meeting of the Advisory Committee to the 1988-89 project, "Demonstration of a Distance Learning Approach to Quality Mathematics Instruction in the Nonpublic Elementary Schools."

I have, therefore, scheduled the meeting for 10:00 a.m.--through noon--in my office:

City University Graduate Center North
25 West 43 Street, between 5th and 6th Avenues
Room 300

10:00 a.m., Thursday, September 8, 1988

At that time we will discuss the selection of schools and teachers, the mathematics topics we will want to address, and the procedures we will use for producing the videotape segments. Your advice and input is invaluable and I sincerely hope you--or your representative--will be able to attend.

I'm looking forward to seeing you then. Thanks again.

cc: Dr. Sandra Clarkson
Dr. Susan Turkel
Dr. Mildred K. Lee
Mr. Foster Henry

jm

The Graduate School and University Center
of The City University of New York

Office of Special Educational Programs / Box 500
Graduate Center, 33 West 42 Street, New York, N.Y. 10036-8099
212/ 575-1493

November 10, 1988

Dear Principal:

For this academic year, CASE (the Center for Advanced Study in Education of The City University of New York, Graduate School and University Center) has an EESA Title II grant from the New York State Education Department to provide quality mathematics instruction in nonpublic religiously-oriented schools in New York City.

Those of you who participated in our mathematics projects in the past, and also newcomers to the project, may be interested to know that this is the fourth year we have been awarded such a grant and that we continue to be the only grantee with a mandate to work with religiously-oriented schools exclusively.

For the current year we will be offering teachers and administrators from select schools an opportunity to take part in six workshops that deal with math topics of critical concern to teachers in the middle elementary grades: grades 4, 5, and 6. The workshop topics and dates are listed below:

. Calculators in the classroom -- January 19, 1989
. Integrating mathematics and science -- February 2, 1989
. Math anxiety in adults and youngsters -- February 16, 1989
. Base 10, place value (with decimals) -- March 2, 1989
. Fractions (the four arithmetic operations)- March 16, 1989
. Geometry (symmetry and congruence) -- April 10, 1989

These topics were selected by a panel of nonpublic elementary school teachers, college instructors of mathematics education, and other experts, based on feedback from several dozen schools similar to yours. They continue to be problem areas for students and staff alike, taking up classroom time, requiring constant review, and when not mastered completely, impeding the learning of more advanced topics.

All six workshops will be led by carefully trained elementary school teachers assisted by math educators from local colleges. The sessions will be held from approximately 1:00 to 4:00 P.M. at The City University of

(continued)

New York (CUNY) Graduate Center in mid-Manhattan (opposite The New York Public Library). All workshop sessions will be videotaped and short teaching tapes will be made.

Schools that participate in the workshops will receive a set of six 20-30 minute videotapes, one on each topic, and instructions for using the tapes in the school. Teachers who attend the workshops will be trained in these topics and shown how to work with other teachers.

To receive the videotapes and training, a school must be represented at a minimum of three of the six workshops--any three of your choice. The same teacher(s) does not have to take part in all three or more sessions, but the more workshops in which your teachers participate, the more expertise will they be able to bring back to the school.

We are very excited about this project and about the opportunity to develop training tapes that not only mirror the circumstances of the nonpublic schools, but that can be used over and over again by teachers and that, in a real sense, bring needed services to the sites where they can be best used.

I will be calling your office next week to review these plans, but if you have any questions or need additional information, please call me at (212) 575-1493.

Sincerely yours,

Barbara R. Heller

Barbara R. Heller
Project Director

CC: Sandi Clarkson
Susan Turkel
Milly Rosner
Joe Greco
Advisory Committee

The Graduate School and University Center
of The City University of New York

Office of Special Educational Programs / Box 500
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Sincerely yours,

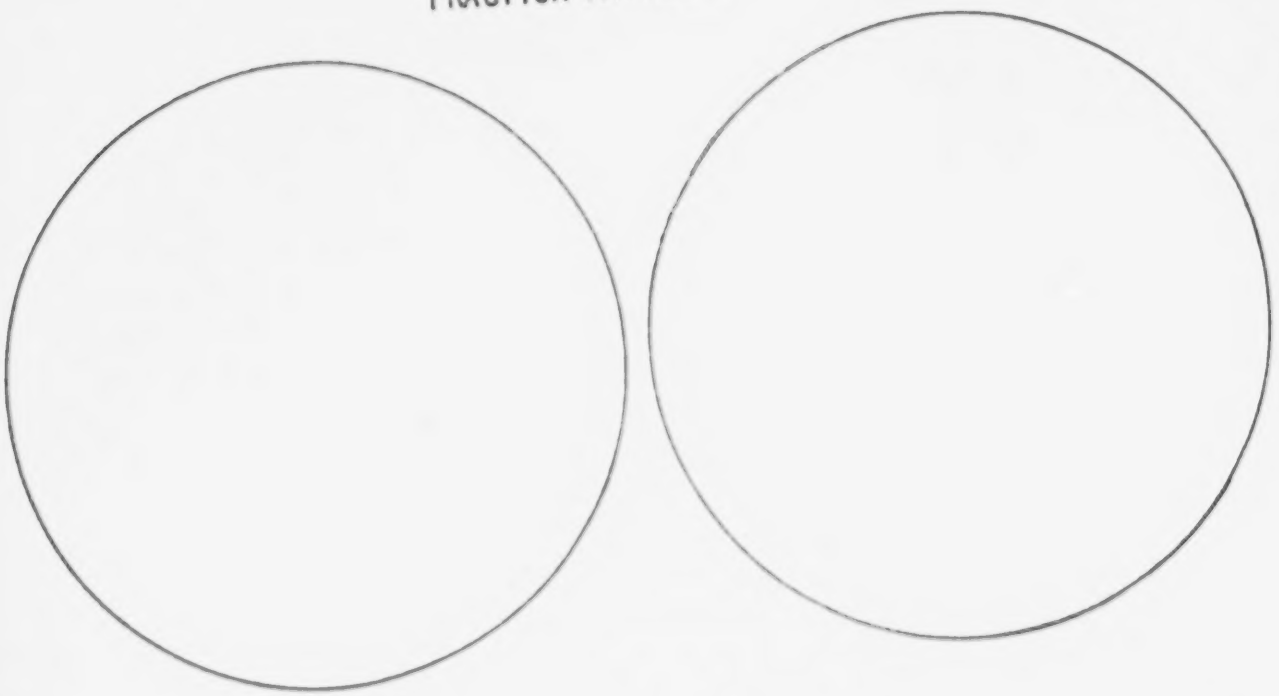
Barbara R. Heller
Project Director

CC: Sandi Clarkson
Susan Turkel
Milly Rosner
Joe Greco
Advisory Committee

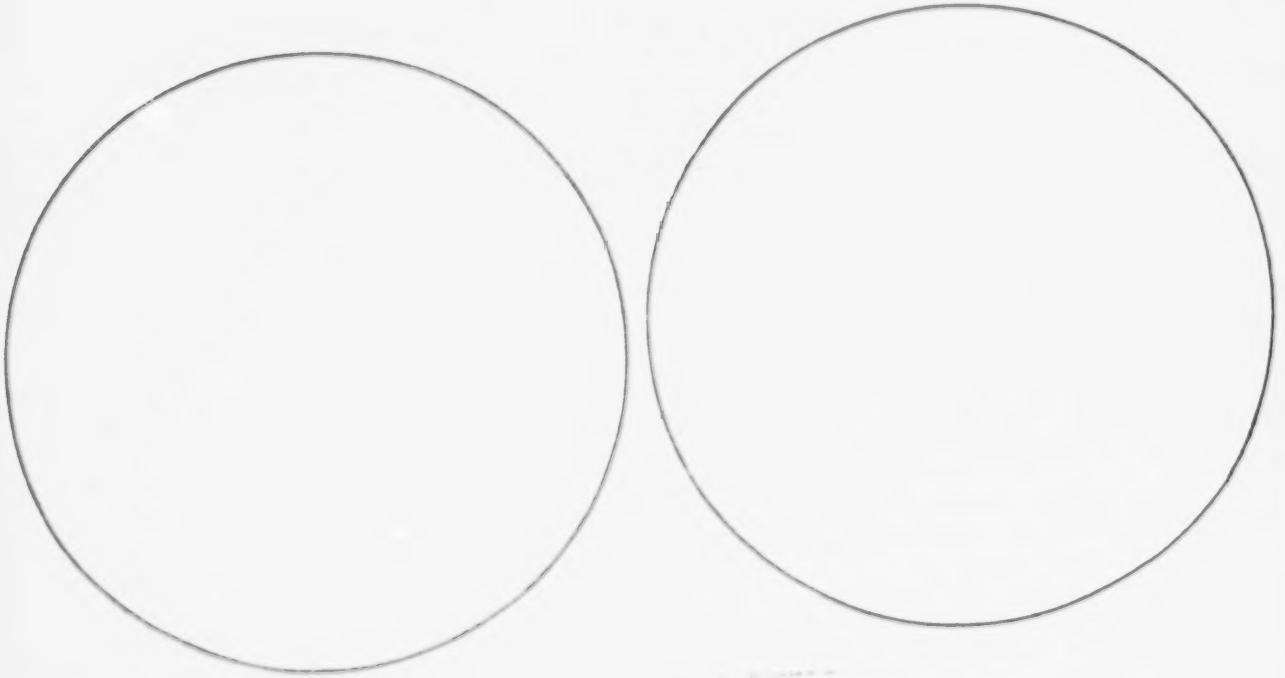
APPENDIX C

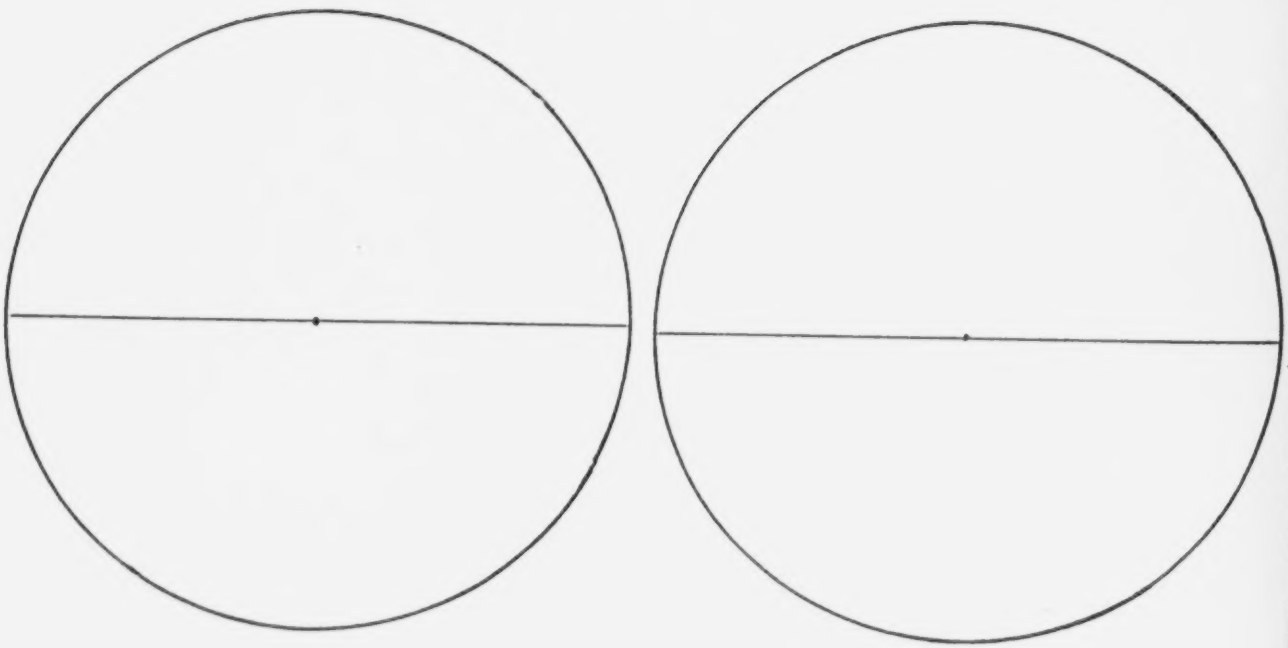
Samples of Manipulative Materials (Workshops #5,6)

FRACTION PATTERNS

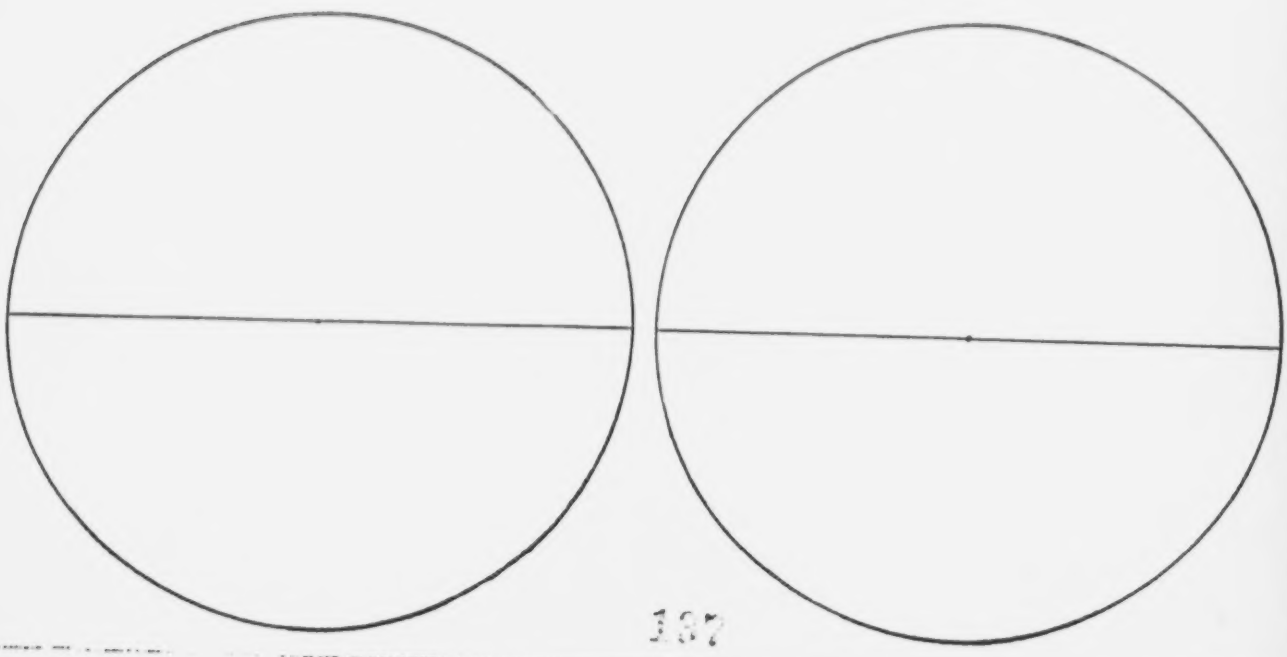


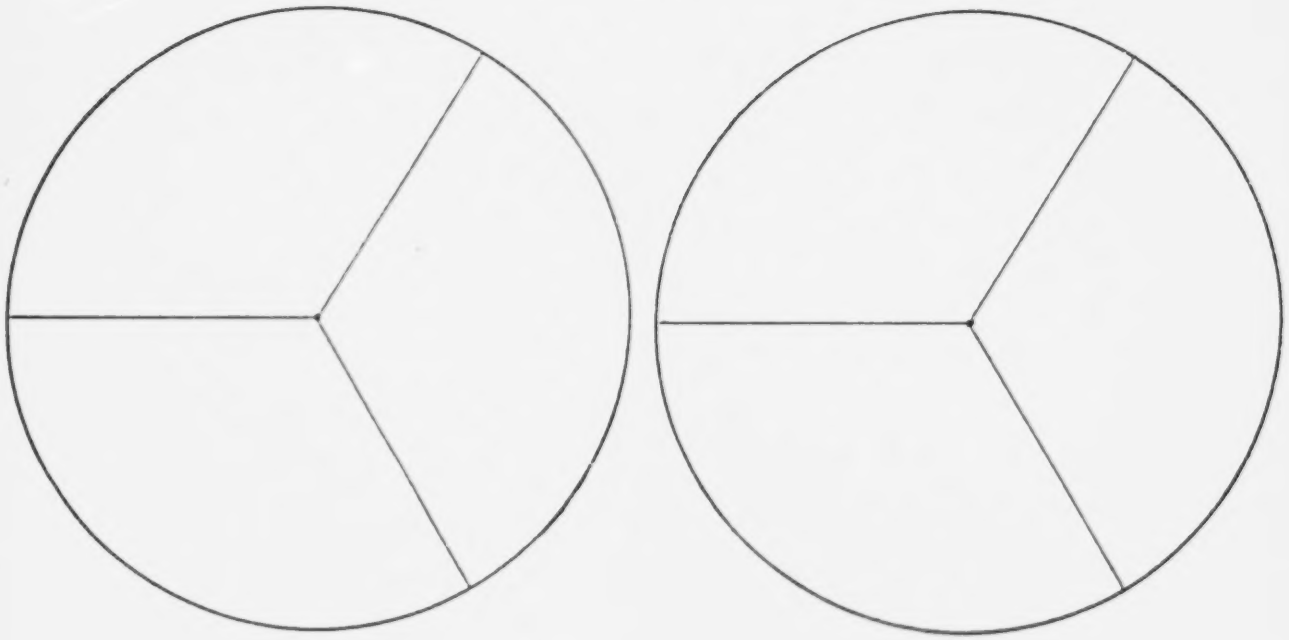
Wholes - White



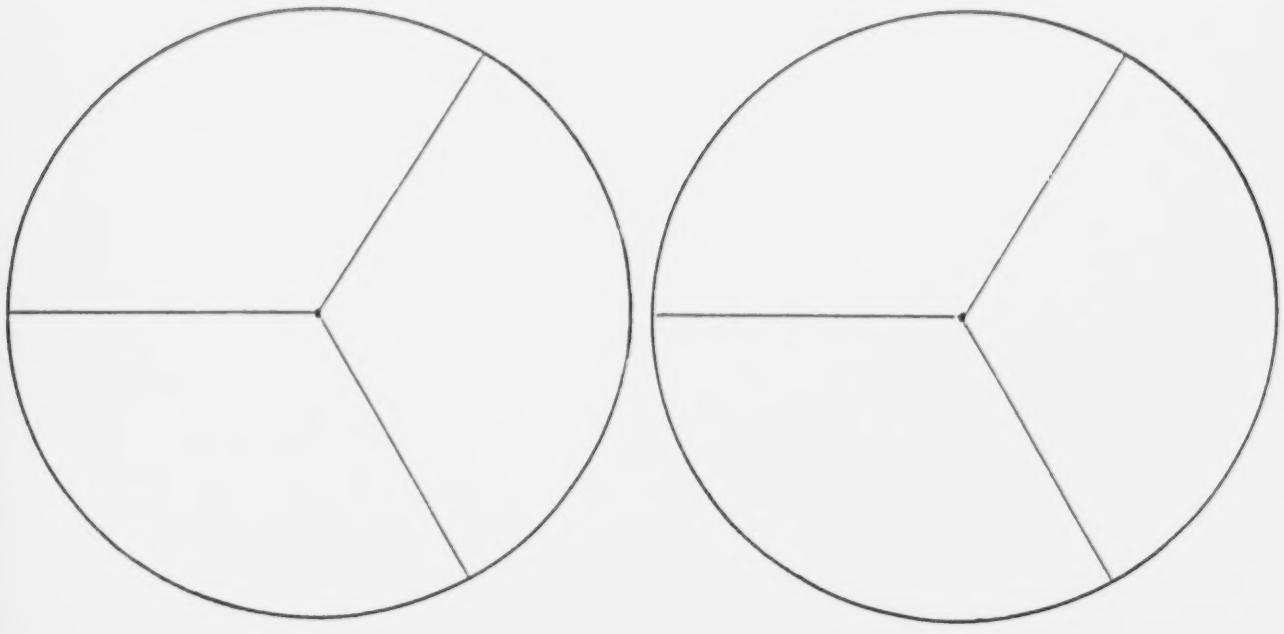


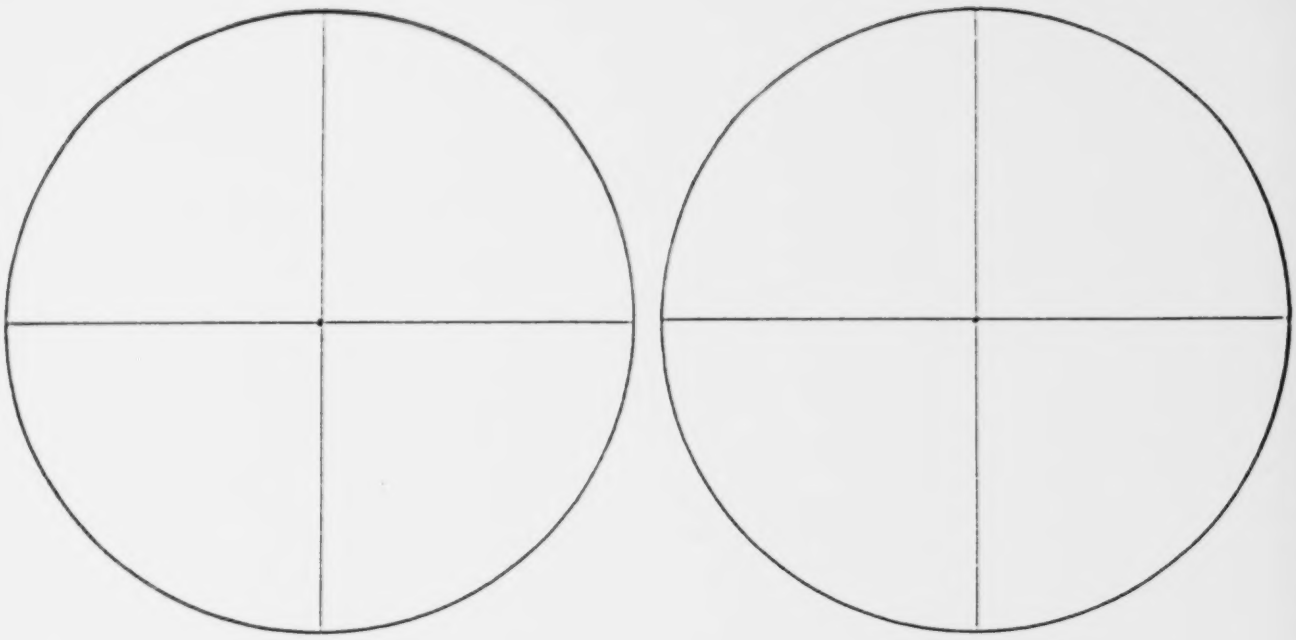
Halves - Yellow



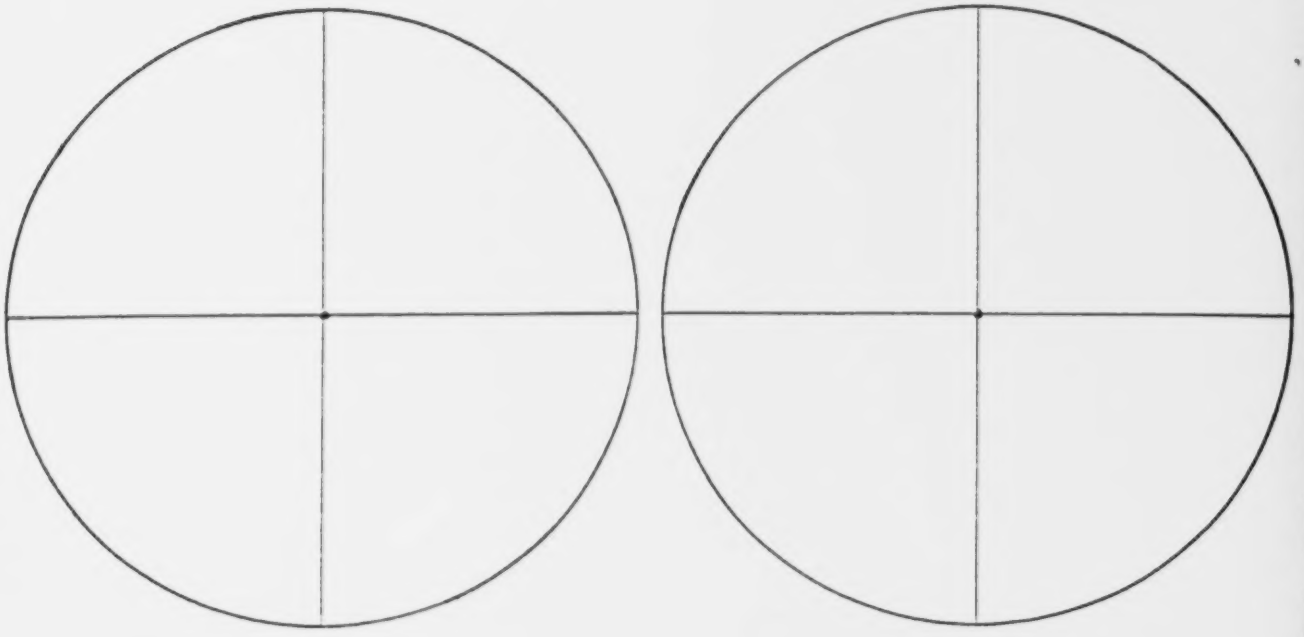


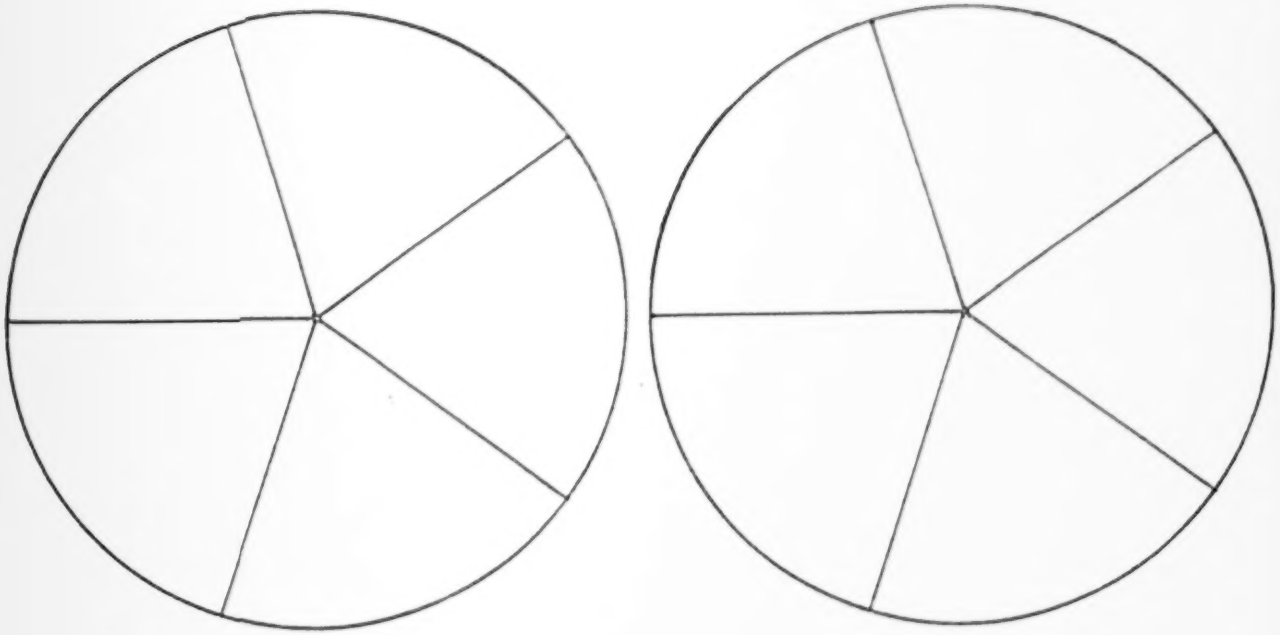
Thirds - Green



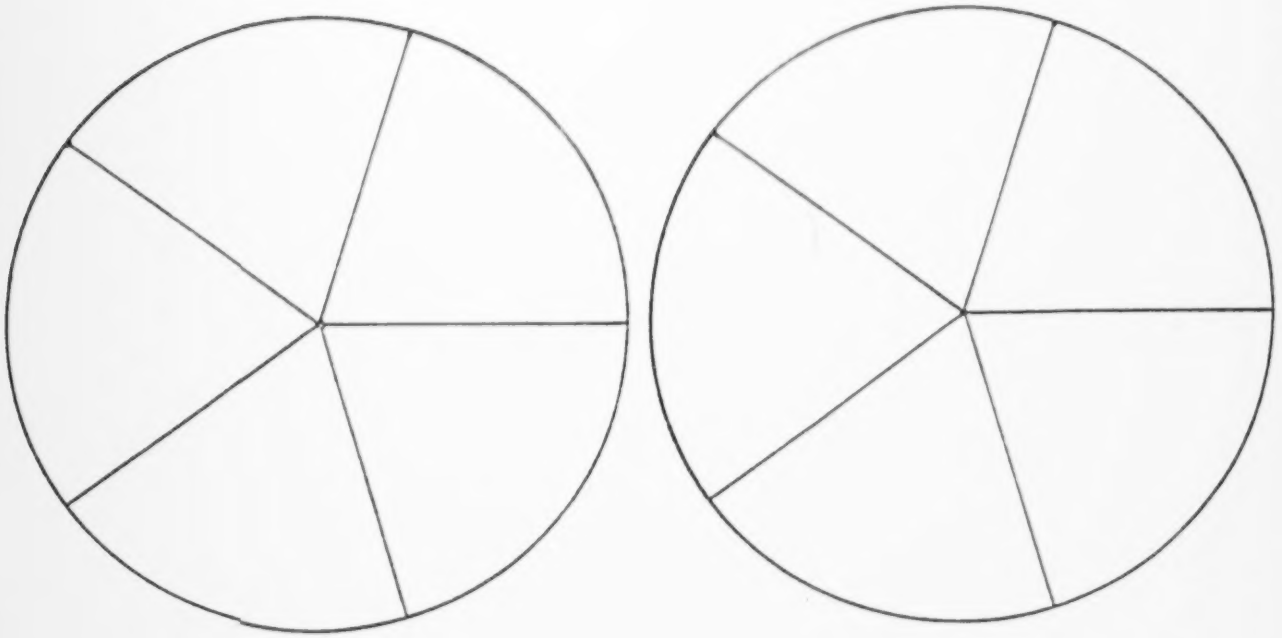


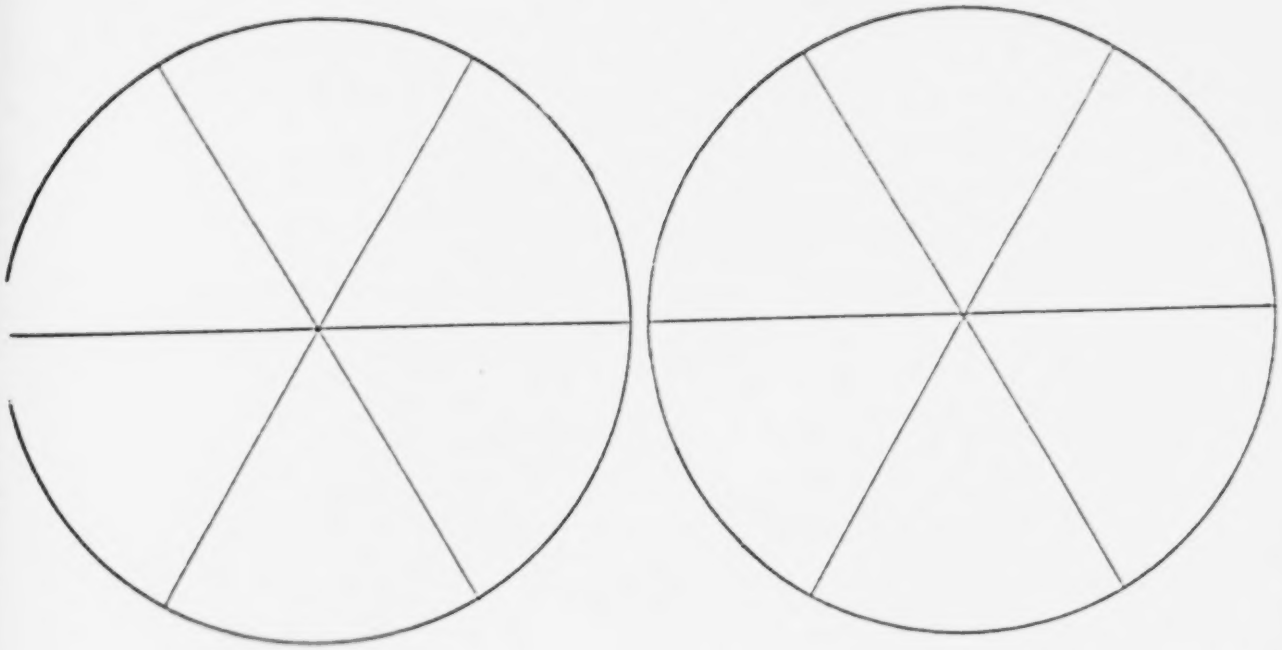
Fourths - Light Blue



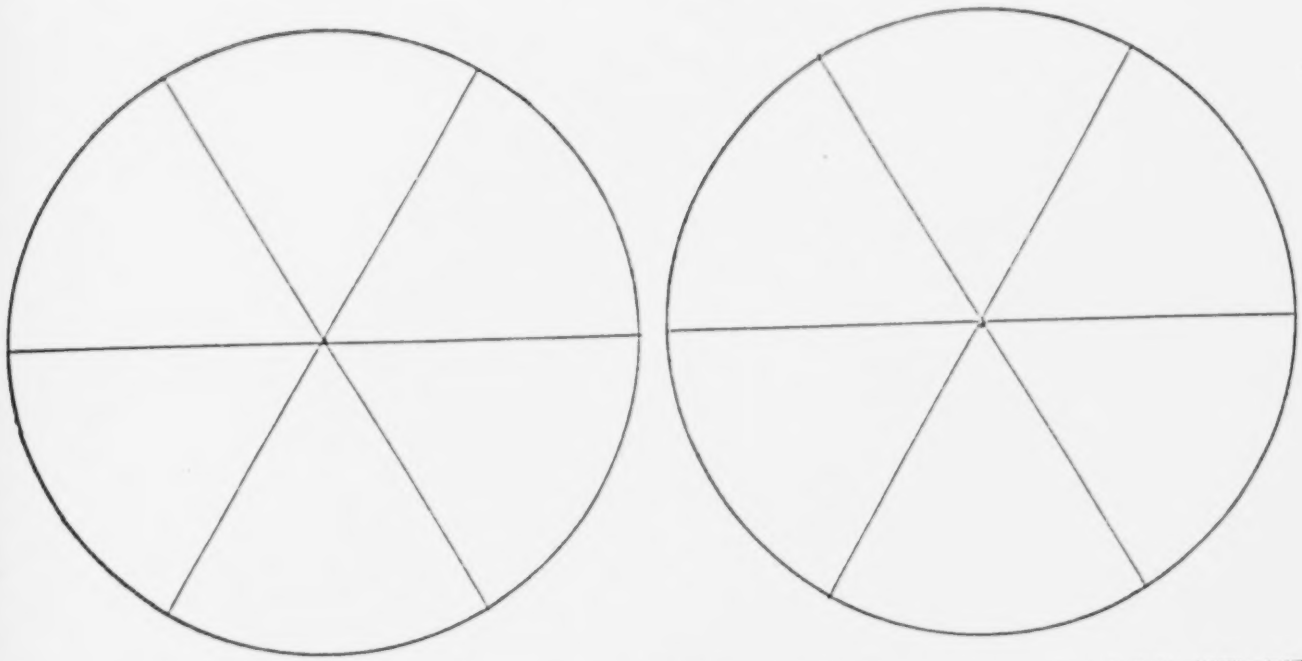


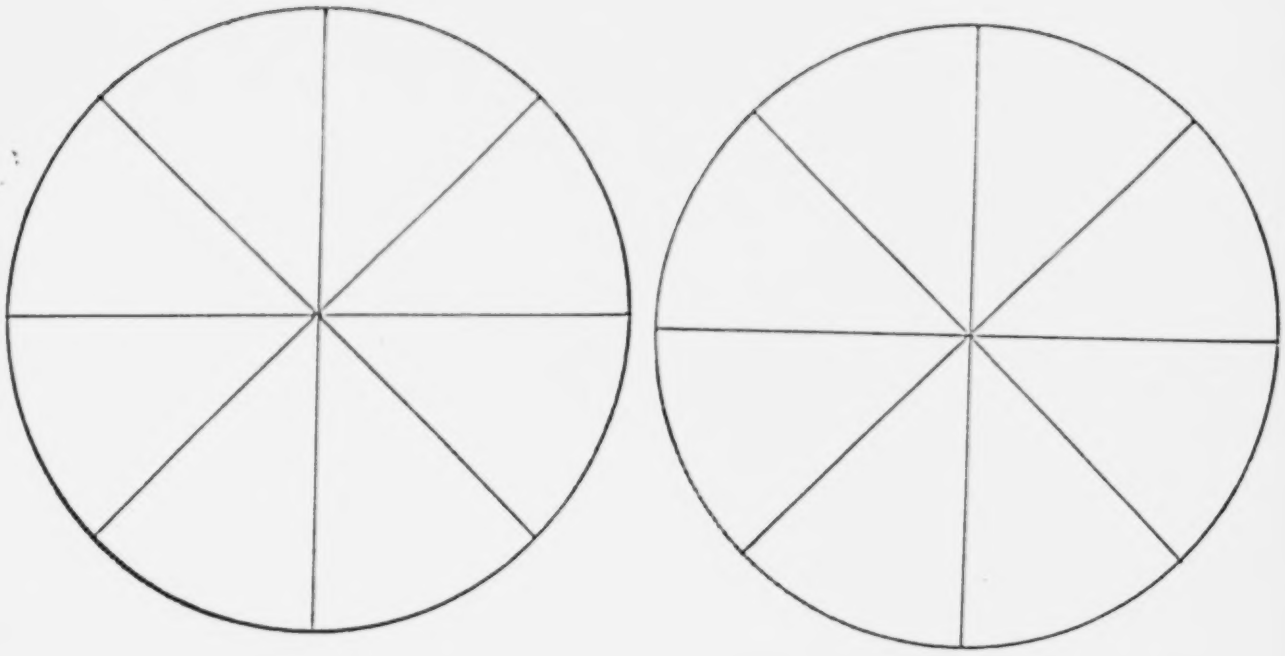
Fifths - Purple



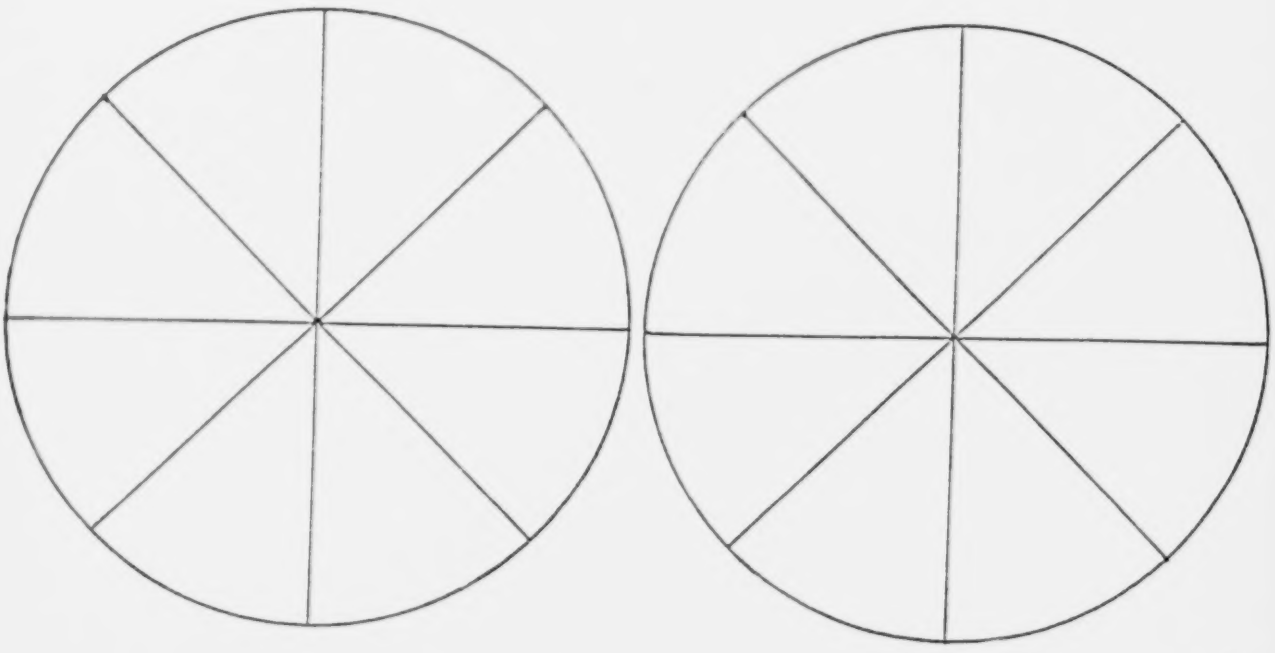


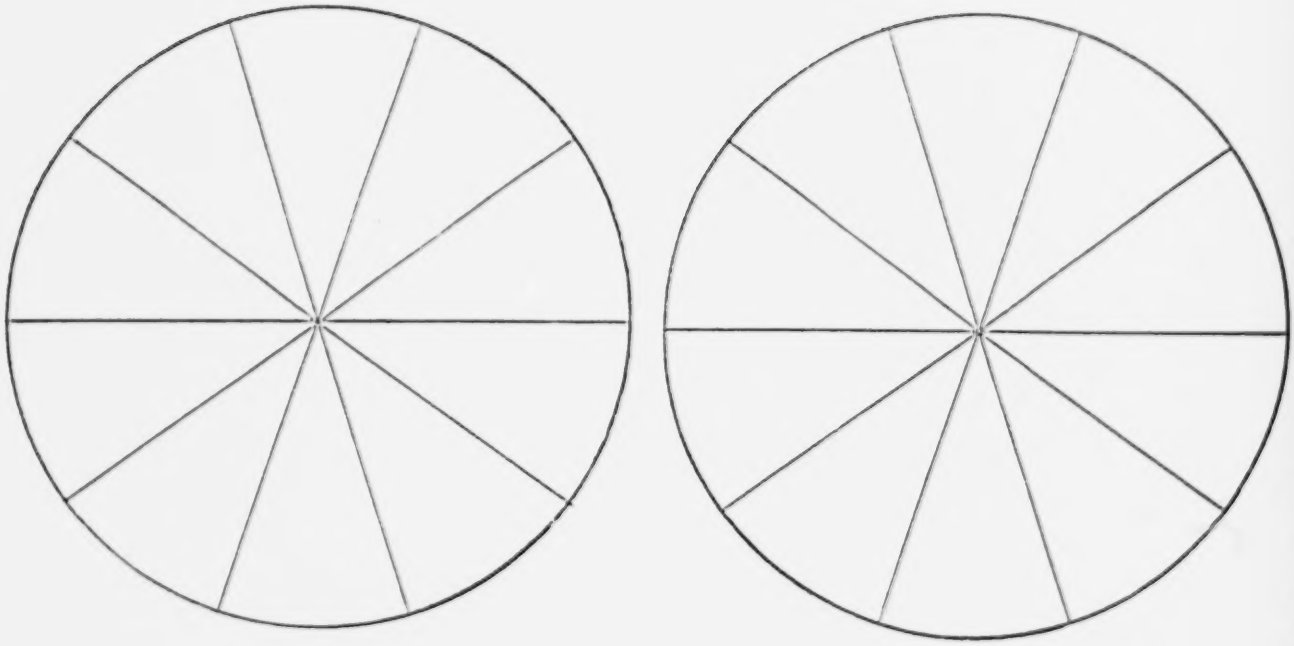
Sixths - Pink



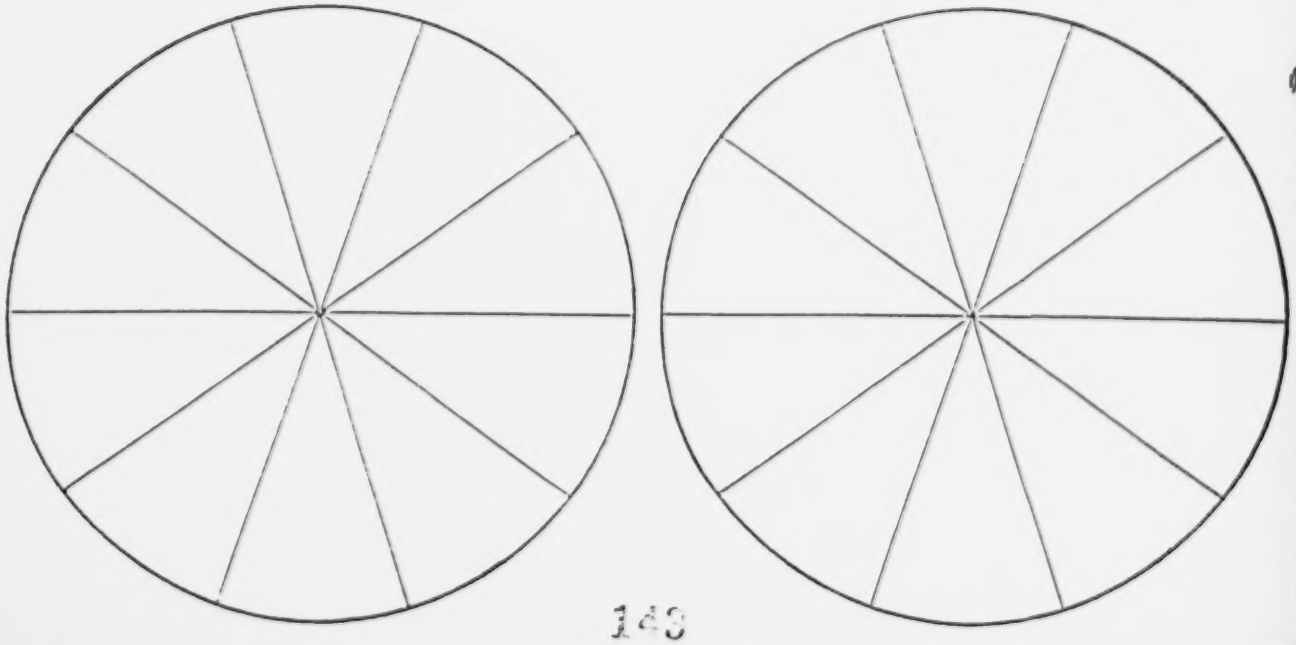


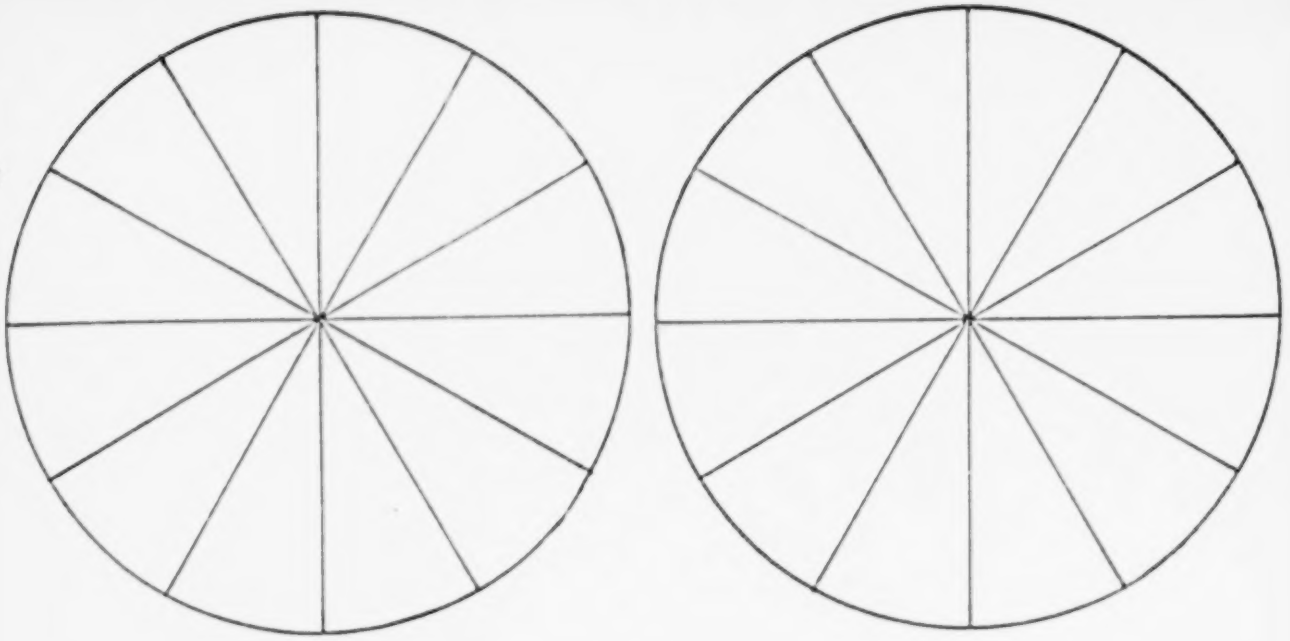
Eighths - Dark Blue



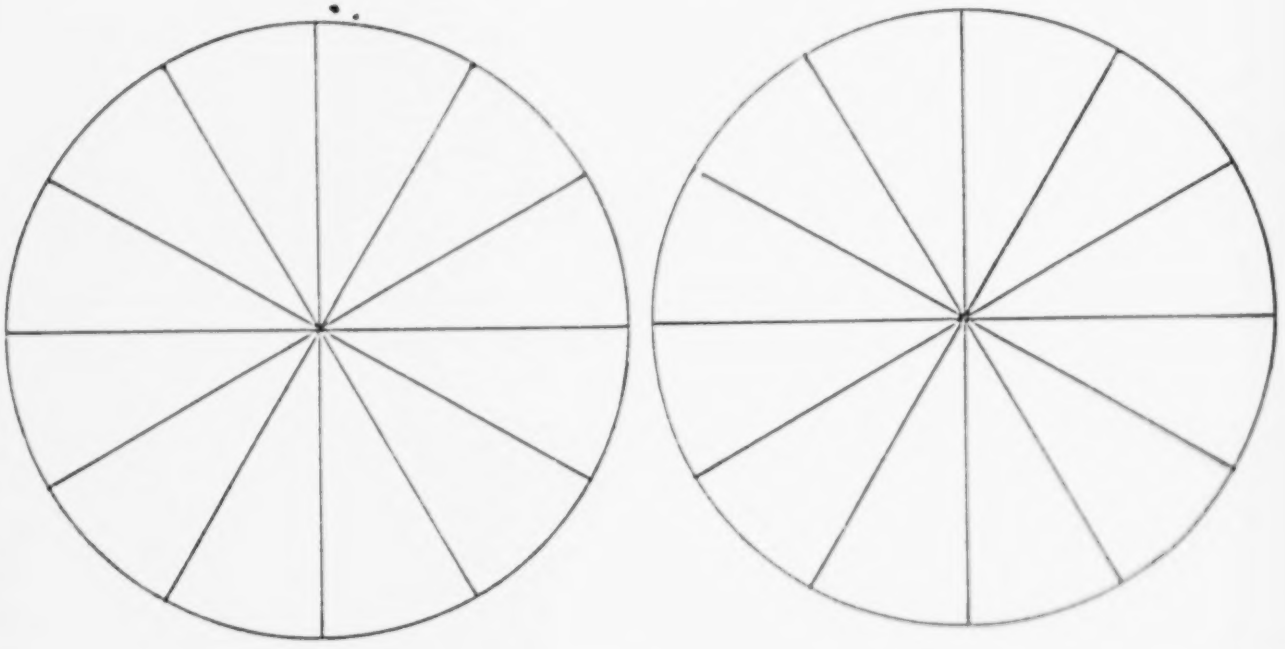


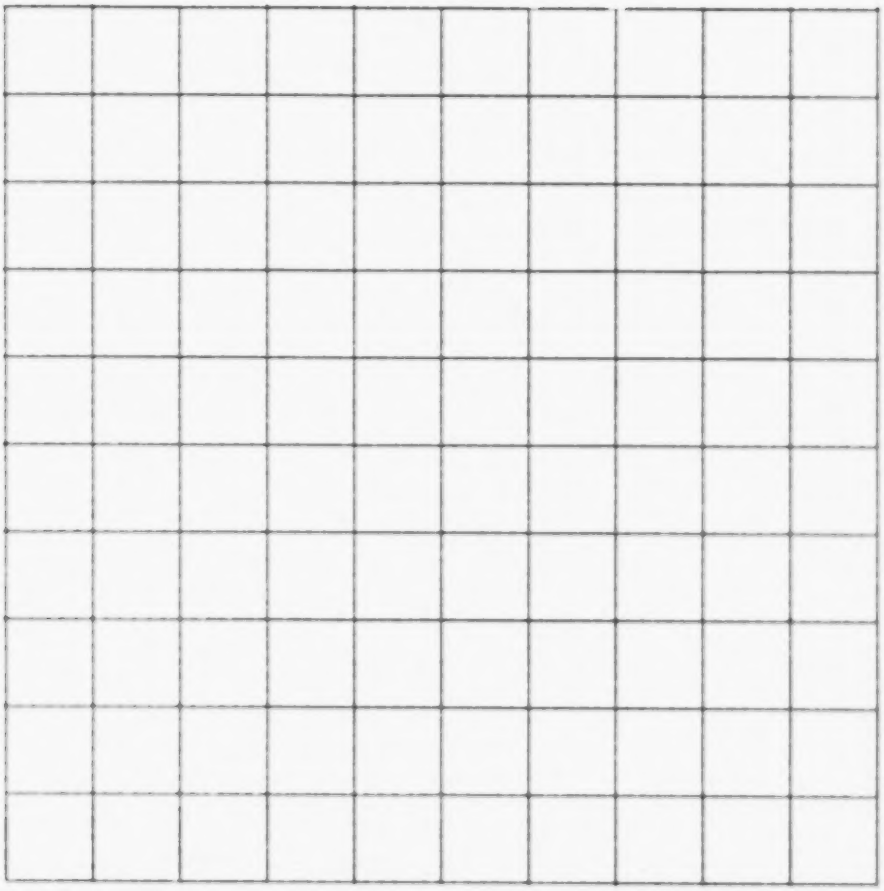
Tenths - Red





Twelfths - Orange





APPENDIX D

Sample Script (outline) for Workshop #1
Sample Activities (Workshops #1,3)
Sample Physical Design Format

CASE Outline

CALCULATORS

1. **OPENING SCENE:** Teachers and students working on a calculator activity, possibly looking for patterns. (Activity Attached) Use the overhead calculator for effect. Students should have the same kinds of calculators.

2. **INTRODUCTION** to use of calculators, using statements from the NCTM standards. (Attached)

3. Discussion of relevant **RESEARCH** (Attached).

In grades K-12, students who use calculators in concert with traditional instruction maintain their skills with paper and pencil without apparent harm. Using calculators can improve the average student's basic skills with paper and pencil, both in working exercises and in problem solving.

The use of calculators in testing produces much higher achievement scores than paper-and-pencil efforts, both in working exercises and in problem sloving.

Students using calculators have better attitudes toward mathematics and better self-concepts in mathematics than students not using calculators.

Current and future uses amy stress the calculator as a pedagogical instrucment in the study of such concepts as place value and decimal operations.

Use calculators in all problem-solving activities, including testing situations.

4. **OVERVIEW** to teachers outlining what teacher does in the classroom with calculators.

Supply the same kind of calculators because:

1. Rounding may differ.
2. Automatic constant/memory differs.
3. Buttons have multiple functions, etc.

The kinds of class room activities you do will be modeled by the activities that you will see in this video.

Important that you, as the teacher, do all activities first before you try them in your class.

5. **INTRODUCTORY ACTIVITY**

6. **USING THE CALCULATOR FOR FINDING PATTERNS**

7. **USING THE CALCULATOR FOR PROBLEM SOLVING**

8. **USING ESTIMATION AND THE CALCULATOR**

9. **SUMMARY:** Recap Why, How, What.

What A Calculator Can Do (For You)

Shown below you will find some of the many ways in which a calculator can be made to do some interesting things.
Work through each activity carefully, always looking for patterns.
Happy calculating.

1) _____

Push 5. Push +. Now push the = button slowly a few times. What happens? (If you can not count by 5's, then it does not have the Automatic Constant feature. You will need to figure out other ways to do these problems.)

a) Get the calculator to count by 10's. By 9's. By 12's.

b) Get your calculator to count by numbers of your choice. Try to guess the numbers before they appear on your calculator.

c) Make up a counting game which can be played with a calculator. Play the game with a friend.

2) _____

Push 100. Push −. Push 5. Now push the = button a few times. What happens?

a) Get your calculator to count backwards from 1,000 by 10's. By 20's. By 25's. By 50's. By 11's.

b) Get your calculator to count backwards from 1,000 by numbers of your choice. Try to guess the numbers before they show on your calculator.

3) _____

Push 1,000,000. Push −. Push 10. Now push the = button a few times. What happens?

Use your calculator to do other problems like the one above. If you make any discoveries, explain them to a friend.

4) _____

Push 2. Push ×. Now push the = button a few times. What is your machine doing here?

Use your calculator to find answers to these problems.

a) 2^{22} = _____ b) 3^{9} = _____

c) 5^{6} = _____ d) 6^{5} = _____

e) 7^{7} = _____ f) 4^{11} = _____

What A Calculator Can Do (For You)

1) Push 1020304. Push +. Now push the = button slowly a few times. What happens?

a) Try doing problems like the one above by starting with 1030507. By starting with 2040608. By starting with 4030201.

b) Explore other problems like this with your calculator. Explain any discoveries you make to a friend.

2) Push 4030201. Push −. Push 100. Now push the = button a few times. What happens?

Use your calculator to experiment with other problems like the one above.

3) Push 2003005. (Think of this as 2+3=5) Push +. Now push the = button a few times and look to see whether you get other equations. Try to guess the equations before they show on your calculator.

Try to get your calculator to show other equations.

4) Multiply 1020304 by some numbers less than 25. What happens?

Try multiplying some numbers less than 25 by 4030201. What happens?

5) Try to get your calculator to display each of the following number sequences in order.

a) 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, . . .

b) 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46, . . .

c) 95, 87, 79, 71, 63, 55, 47, 39, . . .

d) 5, 10, 20, 40, 80, 160, 320, 640, . . .

e) 4, 12, 36, 108, 324, 972, 2916, 8748, . . .

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Discovering Number Patterns

Use your calculator to find the answers until you discover a pattern.
Then try to complete the table mentally.
Count the M's to get your score when you finish.

1)

53 × 111 =
26 × 111 =
43 × 111 =
71 × 111 =
18 × 111 =
32 × 111 =
14 × 111 =
63 × 111 =

2)

22 × 91 =
222 × 91 =
55 × 91 =
555 × 91 =
777 × 91 =
1111 × 91 =
2222 × 91 =
66666 × 91 =

3)

11 × 25 =
111 × 25 =
1111 × 25 =
11 × 34 =
111 × 34 =
1111 × 34 =
111 × 62 =
1111 × 62 =

4)

101 × 2211 =
101 × 5511 =
101 × 1234 =
101 × 6222 =
101 × 7423 =
101 × 2535 =
101 × 3663 =
101 × 4537 =

150

My Score: _____

Calculator Explorations and Problems © Consumers Company of America, Inc.

Personal Data Sheet

Use the calculator to help you find the following information about yourself.

1) Find your age in:

Months _____ Weeks _____ Hours _____

Minutes _____ Seconds _____

2) Find your pulse rate for 30 seconds. _____
At that rate, how many times does your heart beat in:

1 Hour _____ 1 Day _____ 1 Year _____
At the present rate, how many times has your heart

beaten since you were born? _____

3) Find out how far you can count in 30 seconds. _____
At that rate, how long would it take you to count to:

50,000 _____ 1 Million _____

4) Estimate the amount you consume in two weeks:

Hamburgers _____ Cans of soda _____ Candy bars _____

Glasses of milk _____ Cookies _____

(Other) _____ _____ _____
Now find out out much of each you would consume in:

1 Year _____ 5 Years _____ 65 Years _____

5) Find out how far you can walk in 15 seconds. _____
Walking at that rate without stopping, how long
would it take you to walk:

1 Mile _____ 1 Kilometer _____

6) Estimate the amount of money you spend on entertainment

each week. _____ At that rate, how much entertainment
money would you spend in:

1 Year _____ 3,192 Days _____ 8,753 Months _____

7) Use a calculator to compute other data about yourself.

Calculator Explorations and Problems
© Cuisenaire Company of America, Inc.

Problem Solving

1) How many seconds in

One day? ☐

One week? ☐

December? ☐

One year? ☐

2) How many days would it take someone to count to 1 million if he counts at a rate of three numbers every 2 seconds? ☐

3) How many minutes in 4 years? ☐

4) A man is 75 years old. How many hours is that? ☐

5) How many minutes old were you on your ninth birthday? ☐

6) How many days would it take you to spend $1 million if you spend $3 per minute? ☐

7) How many numbers per second would you have to count to get to 1 million in 2 days? ☐

8) A stack of 6 quarters is about 1 centimeter high. How many meters high would a stack of 1 million quarters be? How much money is that? ☐

9) A job pays 1 cent the first day, 2 cents the second day, 4 cents the third day, and so on, doubling each day. During what day would the pay be at least $1 million? ☐

10) One nickel weighs about 5 grams. How much money would one kilogram of nickels be? ☐

Calculator Explorations and Problems
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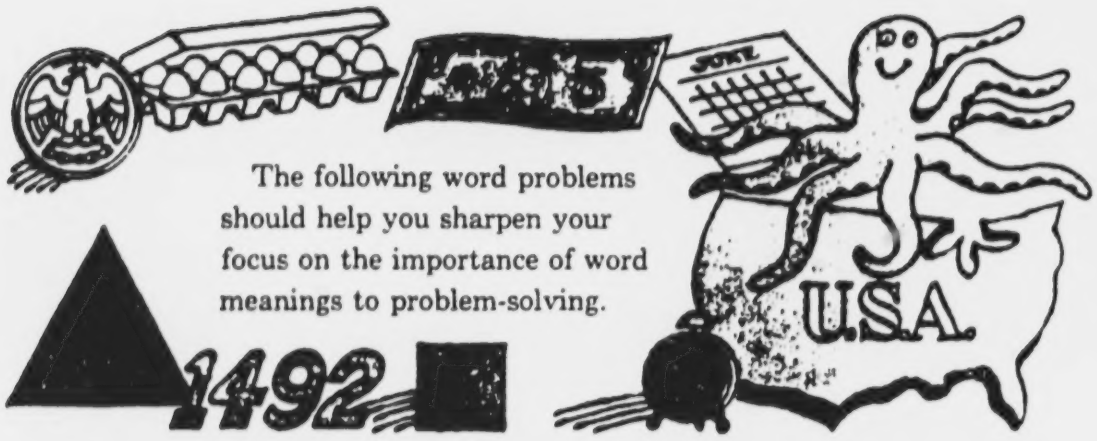


The following word problems should help you sharpen your focus on the importance of word meanings to problem-solving.

1. Take the number of eggs in a dozen.
   Add the number of dimes in a dollar.
   Subtract the number of quarts in two gallons.
   Divide by the number of days in a week.

---

2. Take the year that Columbus discovered America.
   Divide by the number of sides in a square.
   Subtract the number of years in a century.
   Multiply by the number of days in June.

---

3. Take the number of tentacles of an octopus.
   Add the number of legs on an insect.
   Multiply by the number of hours in a day.
   Divide by the number of angles in a triangle.

---

4. Take the number of states in the United States.
   Subtract the number of pennies in a quarter.
   Divide by the number of players on a basketball team.
   Multiply by the number of days in a year.

CALCULATORS IN THE CLASSROOM[1]

January 19, 1989

PROBLEM SOLVING, NUMBER SENSE, CALCULATORS

HOW BIG IS 1 MILLION? 1,000,000 1 thousand thousand

1 million seconds = _____ days

= _____ years

1 million minutes = _____ years

1 million inches = _____ miles

HOW BIG IS 1 BILLION? 1,000,000,000/1 thousand million

1 billion seconds = _____ days

= _____ years

1 billion inches = _____ miles

HOW BIG IS 1 TRILLION? 1,000,000,000,000/1 thousand billion; 1 million million

1 trillion seconds= _____ years

1 trillion inches = _____ miles

Locate large numbers in newspapers, magazines, television, and radio. Ex: The 1987 federal budget was a little over 1 trillion dollars.

Counting 1 trillion dollars at 1 dollar per second would take how many years?

Develop alternate equivalent expressions of large numbers to make them meaningful. Such activities combine writing, social studies, math skills, and problem solving.

---

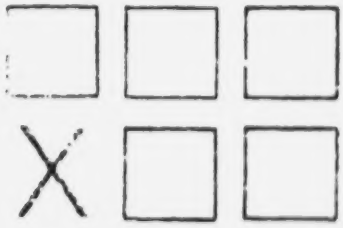
[1] Conducted by CASE, the Graduate School and University Center, CUNY. Material adapted from Number Sense, Mathematics Teacher 9/88 p. 437.

IDEAS

Name _____

Guesstimate

A. Put the numbers 1, 2, 3, 4, and 5 in the boxes below and make the

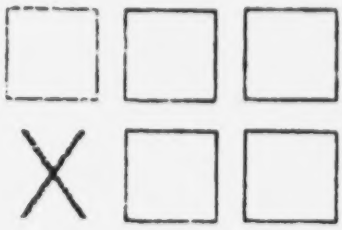


largest product _____

smallest product _____

Use your calculator to help you decide.

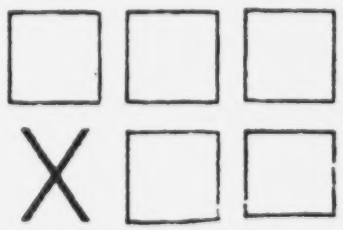
B. Now try these numbers:
5, 2, 4, 6, 0



largest product ___

smallest product ___

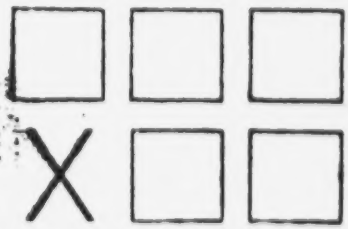
C.
8, 9, 0, 4, 3



largest product ___

smallest product ___

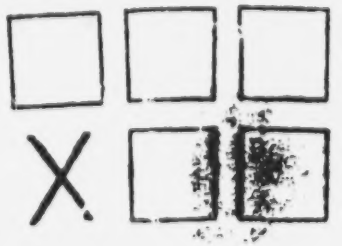
D.
6, 2, 4, 3, 8



largest product ___

smallest product ___

E.
2, 7, 6, 1, 8



largest product ___

smallest product ___

Did you discover a pattern for the largest product? the smallest product?

What is the pattern?

Center for Advanced Study in Education
The City University Graduate Center
MATH ANXIETY WORKSHOP
February 16, 1989

You will have 15 minutes to complete the following problems. Please do all the calculations OR explain in writing the steps needed to solve the problems.

Also, please make note of your feelings as you do the work.

Problem #1

A car goes 20,000 miles on a trip. To save wear, the 5 tires are rotated regularly. How many miles will each tire have gone by the end of the trip?

Problem #2*

The Mach number is the ratio of the speed of an object to the speed of sound in the medium through which the object is traveling. Sound travels through air (at 32°F or 0°C) at about 742 miles per hour. The Concorde is called a supersonic transport (SST) because it travels faster than the speed of sound. If the SST travels at approximately 1,300 mph, what is its Mach speed?

Problem #3*

In NYC, the sales tax is 8¼%. If a new car is $7,870, how much will the car cost and how much of this will we be paying in tax?

(turn over)

MATH ANXIETY DEFINED

Math anxiety describes a range of negative feelings and beliefs about mathematics that causes its victims to suffer from mild to severe discomfort (including physical symptoms); interferes with their ability to concentrate, pay attention, and assimilate mathematical information; and impedes their capacity to deal with mathematical concepts and manipulations in school, in their choice of career and at work, and in everyday situations.

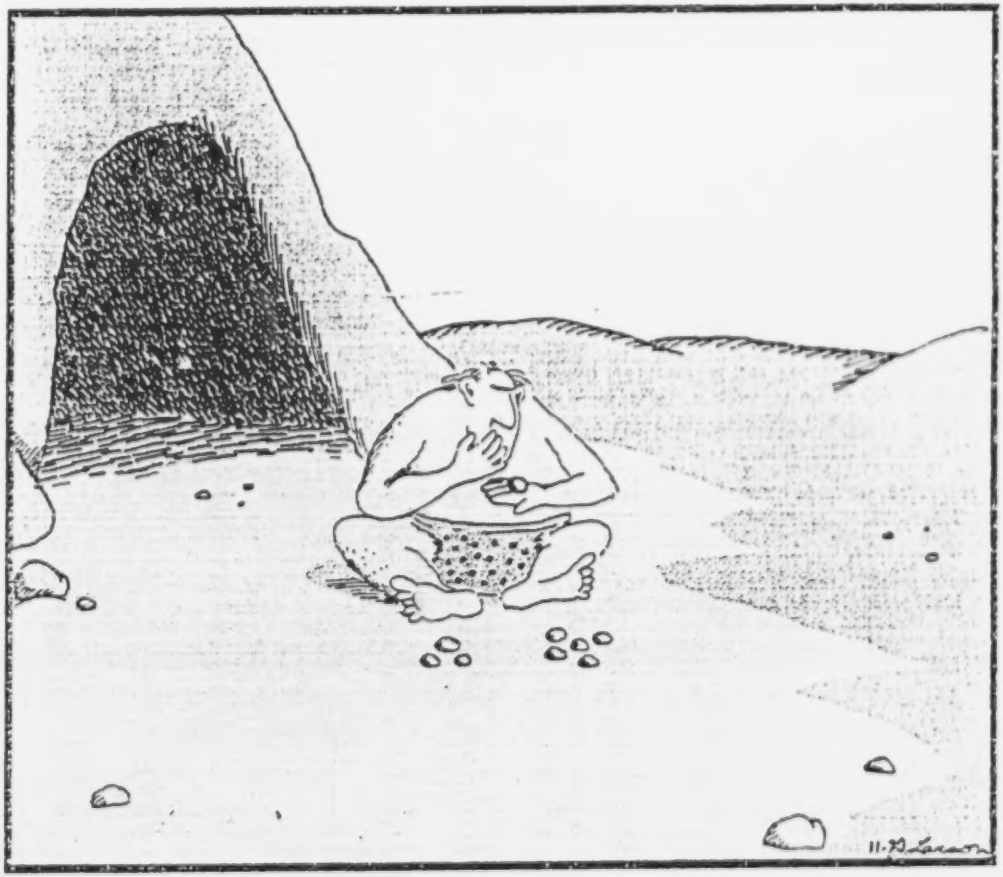
Heller and Kogelman, Creative Classrooms, 1982.

PEANUTS **By Charles Schulz**

YOU KNOW WHAT I THINK YOU HAVE, SIR? YOU HAVE "MATH ANXIETY"
IF I ASKED YOU HOW MANY WAYS THAT NINE BOOKS COULD BE ARRANGED ON A SHELF, WHAT WOULD BE YOUR FIRST REACTION?
AAUGHH!
2-21
SEE? YOU HAVE "MATH ANXIETY"
SCHULZ

c United Features Syndicate Inc.,

THE FAR SIDE



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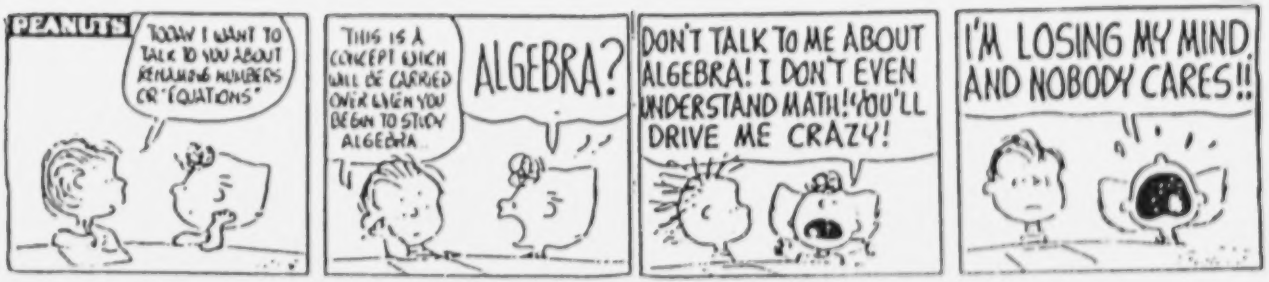
Early stages of math anxiety

THE BORN LOSER

...SO TOTAL AUTOMATION IS THE ANSWER... IT'S AS SIMPLE AS ONE AND ONE ARE TWO!
OR IS THAT ONE AND ONE IS TWO?
SEARCH ME... I'M TERRIBLE AT MATH...

PEANUTS
"7+3=10"... THAT'S AN EASY ONE, MARCIE...
ANYTHING WITH A "3" IS EASY BECAUSE YOU JUST TAKE THE FIRST NUMBER AND THEN COUNT THE LITTLE POINTY THINGS ON THE "3," AND YOU HAVE THE ANSWER!
WHAT ABOUT "TWELVES," SIR?
NO ONE CAN BE EXPECTED TO ANSWER A PROBLEM WITH A "TWELVE" IN IT!
IF A PROBLEM HAS REALLY BIG NUMBERS IN IT, THE ANSWER IS ALWAYS "ONE MILLION"!
MATH IS LIKE LEARNING A FOREIGN LANGUAGE, MARCIE... NO MATTER WHAT YOU SAY, IT'S GOING TO BE WRONG ANYWAY!
LET'S SEE... "NINE PLUS THREE"... I TAKE THE NINE AND COUNT THE LITTLE POINTY THINGS ON THE THREE... TEN, ELEVEN, TWELVE... THE ANSWER IS "TWELVE"... HA!!

NOW SAY WE CUT AN APPLE IN HALF...
WE HAVE TWO HALVES. DON'T WE? NOW...
THAT'S FRACTIONS!! YOU'RE TRYING TO TEACH ME FRACTIONS!
YOU KNOW I'LL NEVER UNDERSTAND FRACTIONS! WHAT ARE YOU TRYING TO DO TO ME? I'LL GO CRAZY! I'LL...


PEANUTS
TODAY I WANT TO TALK TO YOU ABOUT REMAINING NUMBERS OR "EQUATIONS"
THIS IS A CONCEPT WHICH WILL BE CARRIED OVER EVEN YOU BEGIN TO STUDY ALGEBRA...
ALGEBRA?
DON'T TALK TO ME ABOUT ALGEBRA! I DON'T EVEN UNDERSTAND MATH! YOU'LL DRIVE ME CRAZY!
I'M LOSING MY MIND AND NOBODY CARES!!

HANDOUT = 1 (F)

CASTING OUT NINES TO CHECK MULTIPLICATION

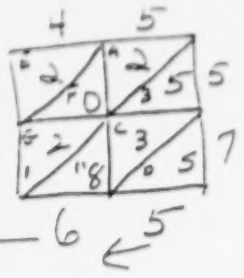
409 (A) 4
×625 (B) ×4
2045 16 = (7)
8180
245400
255,625 (C)

Step
1) In row A - first cross out all the nines or any #s that add up to 9 in that row
(409).
Add the remaining digits 4+0 = 4
(Place 4 next to A)
2) Do same in row B (there are no nines)
6+2+5 = 13 = Add again until you get a 1 digit # ∴ 1+3 = 4
3) Multiply A×B or 4×4 = 16 - Add 1+6 = (7)
4) Do same as step 1 in Row C (no nines)
2+5+5+6+2+5 = 25 ∴ 2+5 = (7)
If both numbers are the same - you're right
(Also 9 is the same as 0 - See below)

45 (A) 4+5 = 9, 9 = 0
×57 (B) 5+7 = 12 1+2 = ×3
315 0
2250
2565 (C) 2+5+6+5 = 18 = 1+8 = 9 = 9 = 0 !

Homework for students - Teach your parent. Have them write me a note saying they learned this

LATTICE MULTIPLICATION

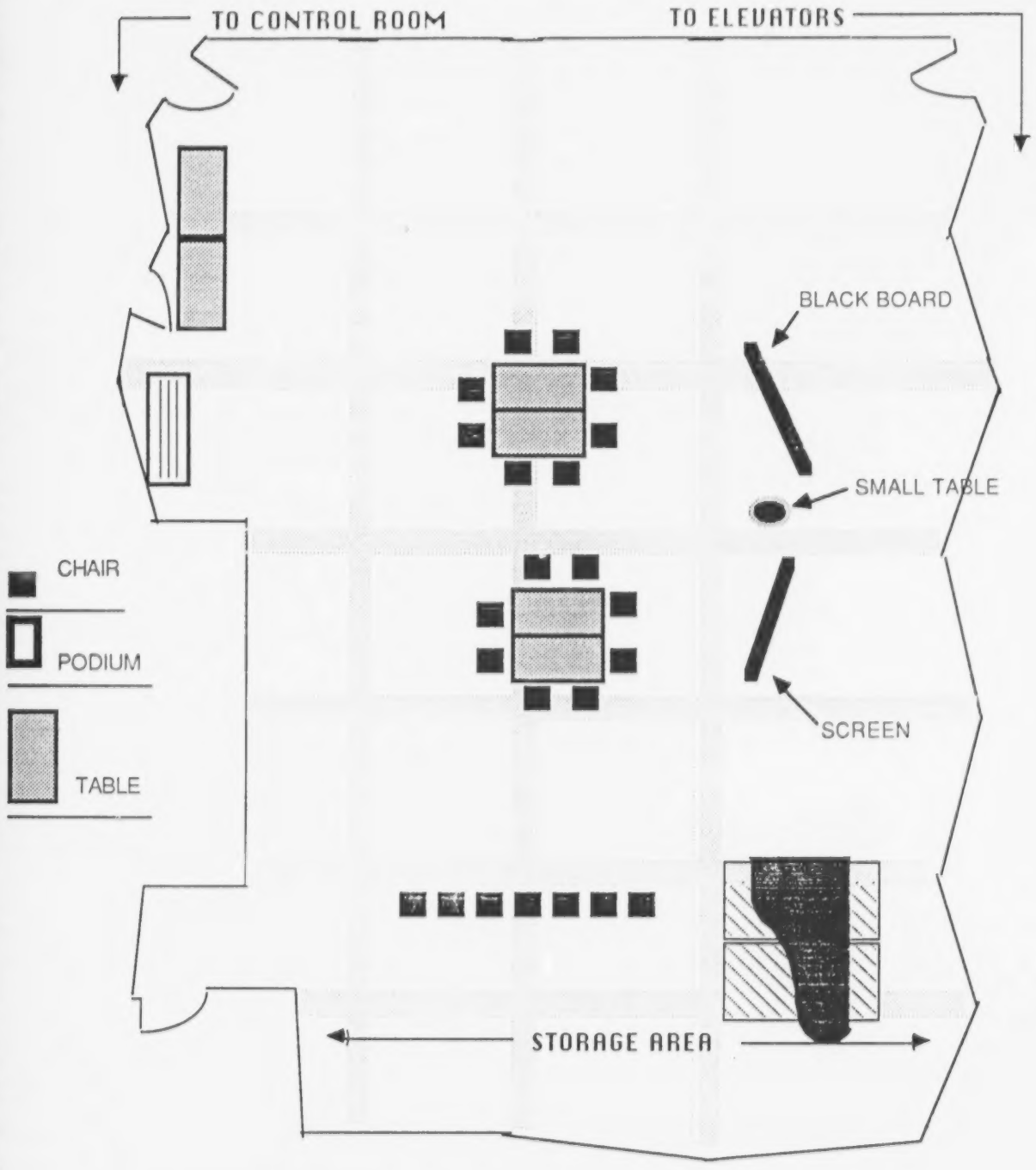


5×5 (box A gets tens; box B gets ones)
5×7 (box C gets tens; box D gets ones)
4×5 (box E .. tens; box F .. ones)
4×7 (box G .. tens; box H .. ones)

P.S. If there are no tens put a zero in that spot

Add on the diagonals (box D is done ∴ 5
boxes B+C+H = 5+5+8 = 16 (carry one)
boxes G+F+A (and 1 you carried)
box E is done = 2)

THIRD FLOOR STUDIO



DATE: JANUARY 19,1989 TIME 9:00 AM TO 5:00 PM

EVENT: C.A.S.E. NONPUBLIC SCHOOL MATEMATICS PROJECT B. HELLER

APPENDIX E

Sample Rating Form

MATHEMATICS WORKSHOP, NONPUBLIC SCHOOLS
Participating Teacher Rating Form
Center for Advanced Study in Education
The CUNY Graduate School and University Center

Name: _____

School: _____

#2 INTEGRATING MATHEMATICS AND SCIENCE (2/2/89)

Your candid and complete responses will help us to evaluate the value of today's presentation, resource materials, and interaction.

I. I LIKED THE SESSION ON INTEGRATING MATHEMATICS AND SCIENCE BECAUSE.....(Check all that apply.)

__I received some new information
__some ideas I heard before were presented in new ways
__the presenter was knowledgeable
__the material was interesting
__the ideas presented were practical
__it gave me new ideas and/or activities to try in my classroom
__it motivated me to try some new techniques
__the presentation was clear
__the presenter was well prepared
__I had an opportunity to work with colleagues from other schools
__I learned additional teaching strategies
__it made me feel more confident
__it made me feel more professional
__other (be specific, please): _____

_____

_____

II. OVERALL ASSESSMENT

Please circle a number below to indicate your overall assessment of the workshop on INTEGRATING MATH AND SCIENCE:

1	2	3	4	5
Poor	Below Average	Average	Above Average	Outstanding

Briefly specify the reasons or factors underlying your overall assessment.

_____

_____

_____

(over)

III. I WOULD HAVE LIKED THE WORKSHOP BETTER IF.. (Please fill in.)

1. More information had been provided about_____
_____

2. (If) it met my needs for_____
_____

3. (If) it met my students' needs for_____
_____

4. Other (Specify other ways in which you would have liked the session more.)
_____

IV. Please briefly describe two specific ideas, suggestions, or techniques you learned as a result of the workshop on INTEGRATING MATH AND SCIENCE.

1. _____

2. _____

V. How confident do you now feel about integrating mathematics and science in some lessons for the children in your class? (Circle one number.)

1	3	4	5
Not confident at all	Not very confident	Somewhat confident	Very confident

Please describe what kind of additional information or support you would need to integrate mathematics and science in your lessons: _____
_____

VI. Once you became accustomed to the cameras and lights, how disruptive did you find the videotaping to be overall?

1	2	3	4
Not disruptive at all	Not very disruptive	Somewhat disruptive	Very disruptive

Do you have any suggestions for videotaping future workshops?
_____

Thank you for completing this evaluation. Please mail it to : B.R. Heller CASE, Room 300N, CUNY Graduate Center, 25 West 43rd Street, New York, New York 10036